INSTRUCTION MANUAL

MODEL 960 SERIES
MICRO SWEEP
1 TO 18.0 GHz
MICROWAVE GENERATORS

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CONTENTS

SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION 1-1
1.2 SPECIFICATIONS 1-1
1.2.1 Frequency Characteristics 1-1
1.2.2 Operating Modes 1-2
1.2.3 Sweep Capability 1-2
1.2.4 External Modulation 1-3
1.2.5 Output Characteristics 1-3
1.2.6 General 1-4
1.2.7 Storage 1-4
1.2.8 Options 1-4
1.3 ITEMS FURNISHED 1-4
1.4 ITEMS REQUIRED BUT NOT FURNISHED 1-4
1.5 TEST EQUIPMENT 1-4

SECTION 2 PREPARATION FOR USE AND INSTALLATION

2.1 MECHANICAL INSTALLATION 2-1
2.2 ELECTRICAL INSTALLATION 2-1
2.2.1 Power Connection 2-1
2.2.2 Signal Connection 2-2
2.2.3 Marker Type Selection 2-2
2.2.4 Z-Axis Blanking Polarity Selection 2-2
2.2.5 Tuning Filter Selection 2-3
2.3 INITIAL CHECKOUT PROCEDURE 2-3

SECTION 3 OPERATION

3.1 CONTROLS, CONNECTORS AND INDICATORS 3-1
3.2 OPERATION 3-3
3.2.1 CW Operation 3-3
3.2.2 Start/Stop Sweep 3-4
3.2.3 ΔF Sweep 3-6
3.2.4 External Triggered Sweep 3-7
3.2.5 Frequency Markers 3-7
3.2.6 ALC/Leveling 3-9
3.2.7 Amplitude Modulation 3-9
3.2.8 Frequency Modulation 3-10
3.2.9 External Tuning 3-10

SECTION 4 CIRCUIT DESCRIPTION

4.1 GENERAL DESCRIPTION 4-1
4.1.1 Power Supplies 4-1
4.1.2 References 4-1
4.1.3 Digital Control 4-1
4.1.4 Waveform Generator 4-1

CONTENTS (Continued)

4.1.5 Frequency and Sweep Control . . . 4-1
4.1.6 YIG Oscillator Control . . . 4-1
4.1.7 YIG Oscillator . . . 4-2
4.1.8 Marker Control . . . 4-2
4.1.9 Modulation and Leveling . . . 4-2
4.1.10 Display . . . 4-2
4.2 DETAILED CIRCUIT DESCRIPTION . . . 4-2
4.2.1 Power Supplies . . . 4-2
4.2.2 References . . . 4-2
4.2.3 Digital Control . . . 4-3
4.2.4 Waveform Generator . . . 4-5
4.2.5 Frequency and Sweep Control . . . 4-10
4.2.6 YIG Oscillator Control . . . 4-16
4.2.7 YIG Oscillator . . . 4-17
4.2.8 Marker Control . . . 4-17
4.2.9 Modulation and Leveling . . . 4-18
4.2.10 Digital Display . . . 4-21

SECTION 5 CALIBRATION

5.1 FACTORY REPAIR . . . 5-1
5.2 EQUIPMENT REQUIREMENTS . . . 5-1
5.3 PRELIMINARY SETUP PROCEDURES . . . 5-2
5.4 CALIBRATION . . . 5-3

SECTION 6 TROUBLESHOOTING

6.1 FACTORY REPAIR . . . 6-1
6.2 BEFORE YOU START . . . 6-1
6.3 ISOLATING A PROBLEM . . . 6-1
6.4 BLOCK ISOLATION . . . 6-1
6.4.1 Power Supplies . . . 6-4
6.4.2 References . . . 6-4
6.4.3 Frequency and Sweep Control Block . . . 6-4
6.4.4 Waveform Generator Block . . . 6-4
6.4.5 Marker Control Block . . . 6-4
6.4.6 YIG Oscillator Control Block . . . 6-4
6.4.7 Modulation and Leveling . . . 6-4
6.5 TROUBLESHOOTING GUIDES . . . 6-5
6.5.1 Power Supplies . . . 6-5
6.5.2 References . . . 6-6
6.5.3 Digital Control Block . . . 6-7
6.5.4 Waveform Generator . . . 6-9
6.5.5 Frequency and Sweep Control . . . 6-15
6.5.6 YIG Oscillator Control Block . . . 6-19
6.5.7 YIG Oscillator . . . 6-21
6.5.8 Modulation and Leveling . . . 6-21

CONTENTS (Continued)

6.5.9 Marker Control Block 6-23
6.5.10 Display Block 6-25
6.6 TROUBLESHOOTING INDIVIDUAL COMPONENTS 6-27
6.6.1 Transistors 6-27
6.6.2 Diodes 6-28
6.6.3 Operational Amplifiers 6-28
6.6.4 FET Transistor 6-28
6.6.5 Capacitors 6-28
6.6.6 Digital TTL Integrated Circuits 6-28
6.6.7 Reed Relays 6-28
6.6.8 Light Emitting Diodes (LED) 6-28

SECTION 7 PARTS LISTS AND SCHEMATICS

7.1 DRAWINGS 7-1
7.2 ADDENDA 7-1
7.3 ORDERING PARTS 7-1

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SAFETY

This instrument is wired for earth grounding via the facility power wiring. Do not bypass earth grounding with two wire extension cords, plug adapters, etc.

While the very low power of the RF energy generated in this instrument makes it ordinarily nonhazardous, extremely close and prolonged proximity of an eye to the RF output could cause injury.

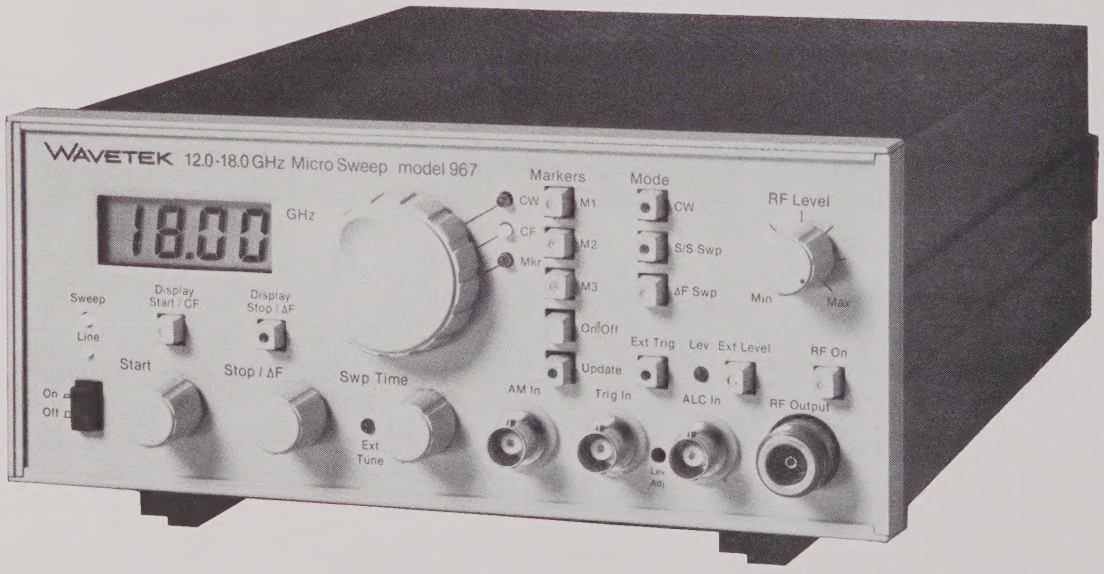
BEFORE PLUGGING IN the instrument, comply with installation instructions.

MAINTENANCE may require power on with the instrument covers removed. This should be done only by qualified personnel aware of the electrical hazards.

The instrument power receptacle is connected to the instrument safety earth terminal with a green/yellow wire. Do not alter this connection. (Reference: ⏚ or ⚠ stamped inside the rear panel near the safety earth terminal.)

WARNING notes call attention to possible injury or death hazards in subsequent operations.

CAUTION notes call attention to possible equipment damage in subsequent operations.



Series 960 Micro Sweep

SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION

The 960 Micro Sweep series consist of four compact, lightweight microwave sweep generators that collectively cover the 1 to 18 GHz frequency range. These generators feature three operating modes (Start/Stop Sweep, ΔF Sweep, and CW) with three independently settable frequency markers. Frequency is displayed to 10 MHz resolution on a LCD display.

Frequency can be swept using either of two sweep modes (Start/Stop Sweep and ΔF Sweep). In Start/Stop Sweep, both the start and stop frequencies can be independently set; the Micro Sweep may be swept up or down in frequency. In ΔF Sweep, the center frequency and total frequency deviation each can be controlled; ΔF Sweep sweeps symmetrically upward only. For both sweep modes, the maximum sweep width is 100% of a Micro Sweep's frequency band, while the minimum sweep width is approximately 1%. Both sweep can be auto-triggered (continuous sweep) or triggered which allows the sweep to be started by an external signal. Furthermore, the frequency can be remotely controlled (External Tune) or frequency modulated (FM).

Three independently settable frequency markers can be used in the two sweep modes, CW, and external frequency tuning. These markers may be RF PIP, Z-Axis, or both. Internal switches select the type of marker. Plus, the polarity of the Z-Axis (Intensity markers) output can be set, using internal switches, for either positive or negative intensity control of an oscilloscope trace. In addition, marker intensity or PIP depth also can be set.

Output power is continuously variable. Maximum power is greater than +12 dBm, unleveled, or +10 dBm internally leveled. RF level control range is greater than 25 dB, unleveled, and a nominal 7dB when leveled. An optional internal leveler (Option 001) maintains the output level within ±1.0 dBm or better across the Micro Sweep's frequency band. The RF output also may be leveled using an external coupler and diode detector. The output can be amplitude modulated (AM) using an external signal.

1.2 SPECIFICATIONS

1.2.1 Frequency Characteristics

Frequency Range

The frequency ranges of the Model 960 Series Micro Sweeps are as follows:

Model 962	1.0 — 4.0 GHz
Model 964	3.7 — 8.4 GHz
Model 965	7.0 — 12.4 GHz
Model 967	12.0 — 18.0 GHz

Frequency Accuracy

When operated at 25°C ±10% and maximum RF output, the absolute frequency accuracy of the Model 960 Series Micro Sweep is better than ±1% (0.5% typical) for CW, ±1% (typical) for Markers and Center Frequency, and ±2% (typical) for Start, Stop, and ΔF.

Display Resolution

The front panel display resolution is 10 MHz.

Frequency Stability

The frequency stability (typical) of the Model 960 Series is measured after 1 hour warm-up in a constant environment. Other conditions apply as indicated.

With Temperature	0.007% per °C (0 to +50°C).
With Line Voltage	0.001% with 10% line voltage change.
With Time: Short Term	0.004% over 5 minutes (after 1 hr. warm up and 15 minutes following any frequency change).
With Time: Long Term	0.01% over 1 hr. (after 1 hr. warm up and 15 min. following any frequency change).
With Load (midband 3:1 VSWR)	0.1%.

Spectral Purity

	Model			
	962	964	965	967
Residual FM Peak (50 Hz to 15 kHz post-detection bandwidth)	8 kHz	15 kHz	20 kHz	25 kHz
Spurious	– 55 dBc	– 55 dBc	– 55 dBc	– 55 dBc
Harmonics (maximum)	– 12 dBc*	– 20 dBc	– 20 dBc	– 20 dBc

* For output levels less than – 10 dBm, the harmonic specification is – 10 dBc.

Frequency Control

Manual Tuning: A ten turn control knob sets the CW frequency, marker frequencies, and Center Frequency (CF in ΔF Swp). Two single turn control knobs set the Start, Stop, and ΔF frequencies.

External Tune: 0 to + 10V controls the Micro Sweep for the full tuning range; Swp Time control must be in the Ext Tune position for external frequency tuning.

1.2.2 Operating Modes

Start/Stop Sweep: Sweeps from the frequency set by the Start control to the frequency set by the Stop/ΔF control. Both frequencies are continuously adjustable over full range. Pressing the front panel S/S Swp pushbutton selects the Start/Stop sweep mode. Pushbuttons below the LCD readout select the frequency displayed. Minimum practical sweep width is approximately 1 % of band. Downward sweep is permitted but does not provide markers.

ΔF Sweep: Sweeps symmetrically upward, centered on the frequency (CF) set by the main tuning knob. Pressing front panel ΔF Swp pushbutton selects the ΔF sweep mode. Sweep width is set by using the Stop/ΔF sweep control, and the center frequency is set with the main tuning knob. Pushbuttons below the LCD readout select the frequency displayed. Width is adjustable from 100% to less than 1 % of the band. Sweeping beyond the frequency limits of the Micro Sweep is not permitted.

CW Operation: Single frequency RF output is controlled by the main tuning knob. Pressing front panel CW mode pushbutton selects the CW mode. An illuminated LED near the main tuning knob indicates when the knob is functioning as CW, Center Frequency, or marker frequency control.

1.2.3 Sweep Capability

Sweep Modes

The two sweep modes (Start/Stop and ΔF Swp) are described in paragraph 1.2.2.

Sweep Time Continuously adjustable from 0.02 to 20 seconds, nominal, per sweep.

Sweep Out/Ext Tune In

Internal Sweep — Sweep output is 0 to + 10V direct-coupled, modified sawtooth waveform regardless of sweep width.

CW — Sweep output is linearly proportional to frequency with 0V (lowest frequency) to + 10V (highest frequency), nominal, for full Micro Sweep bandwidth.

Frequency Markers

Three constant width markers, independently adjustable over the full frequency band of the Micro Sweep, are available for all sweep functions (Start/Stop, ΔF, and Remote) plus CW. Markers are only produced when the frequency is swept from low to high frequency.

Intensity Marker: A rectangular pulse provides a marker signal for the Z-axis input to oscilloscope. Pulse polarity is factory set for a negative-going pulse, but may be changed to a positive-going pulse via an internal switch (see paragraph 2.2.3 and figure 3-4). Retrace blanking signal will be of the opposite polarity. A front panel trim adjustment permits intensity adjustment.

Amplitude (RF PIP) Marker: The RF PIP marker is generated by momentarily reducing the RF output. (Factory set position enables this type of marker.) The RF PIP maker can be disabled with an internal switch (see paragraph 2.2.3). A front panel trim adjustment permits PIP depth adjustment.

Operation: Marker 1, Marker 2, and Marker 3 are set in any order by first pressing the pushbutton of the desired marker and displaying its frequency on the LCD readout; this activates the marker to accept other commands. The marker being displayed and operated on is identified by a flashing indicator. Markers which are off will blink with a short duty cycle, and markers which are on will blink with a long duty cycle. The marker is then toggled on or off using the On/Off pushbutton. The marker frequency is changed by pressing the Update pushbutton to "on" and then adjusting the main turning knob.

Resolution: Each marker may be set to a digitized resolution of 0.1% of the Micro Sweeps bandwidth. Display resolution is 10 MHz.

Blanking

During retrace, a +5V, nominal, direct coupled rectangular pulse provides the Z-axis input to the oscilloscope. Polarity may be changed to negative by changing an internal switch (see paragraph 2.2.4 and figure 3-4). RF blanking is not provided.

Sweep Trigger

Auto-Trigger: Sweep is automatically triggered on a continuous basis.

External Trigger: A single sweep is triggered by a signal at the front panel Trig In BNC. Pressing the Ext Trig pushbutton selects this mode as indicated by an illuminated Ext Trig pushbutton. The sweep is triggered by the falling edge (high or low) of a TTL signal or a switch contact closure to ground. A double press of the pushbutton will manually trigger a single sweep at slower sweep rates; there will be a brief delay before the sweep begins.

1.2.4 External Modulation

AM

Depth	0 to 25 dB min. (30 dB typical) for a 0 to +10V input.
Bandwidth	50 kHz typical 3dB bandwidth, dc coupled.
Input Impedance	10 kΩ nominal.

FM

Deviation	±5MHz min. deviation for ±4V input.
Bandwidth	50 kHz typical, 3dB bandwidth, dc coupled.
Input Impedance	10kΩ nominal.

1.2.5 Output Characteristics

(See table 1-1.)

Table 1-1. Output Characteristics

	Model			
	962	964	965	967
Output Power				
Unleveled (without internal leveling option 001)	+12 dBm	+12 dBm	+12 dBm	+12 dBm
Leveled (via internal leveling option 001)	+10 dBm	+10 dBm	+10 dBm	+10 dBm
Unleveled (with internal leveling option 001 installed	+11 dBm	+11 dBm	+11 dBm	+11 dBm
RF Level Control Range				
Unleveled Operation		25 dB minimum, 30 dB typical.		
Leveled Operation		7 dB nominal.		
RF Leveling				
Internal Option		Flat ±1.0 dB, maximum.		
External Leveling (at maximum output using HP 8472A negative polarity detector and 16 dB coupler)		Flat ±0.1 dB maximum, excluding coupler/detector variations.		
Input Sensitivity		−50 dB/mV nominal, gain adjustment provided at front panel.		
Input Impedance		1kΩ nominal.		
Output Impedance		50Ωnominal.		
VSWR (with internal leveling option)	<2.5	<1.5	<1.5	<1.5

1.2.6 General

Connectors

RF Output:	Precision Type N.
AC Power:	CEE22 Type VI.
All Others:	BNC.

Environment

Operating Temperature:	0 to +50°C.
Nonoperating Temperature:	−40 to +75°C (Rate of temperature change not to exceed 1° per minute).
Humidity:	0 to 95% noncondensing.
Dimension:	21.6 cm (8½ in.) wide; 9.8 cm (3½ in.) high; 29.9 cm (11¾ in.) deep.
Weight:	5.4 kg (12 lb), nominal.
Power:	90 – 126V or 198 – 252V; 50 – 400 Hz; 40 VA.

1.2.7 Storage

Short Term (<30 days): Same as Environmental limits; see 1.2.6 General.

Long Term (>30 days): Refer to Preparation for Shipment; see 1.2.6 General.

1.2.8 Options

001 Internal Leveling

1.3 ITEMS FURNISHED

Each Micro Sweep is shipped with an instruction manual and a power cable.

1.4 ITEMS REQUIRED BUT NOT FURNISHED

50Ω BNC and 50Ω Type N coaxial cables are required to interconnect the Micro Sweep to other devices during operation. Items referenced in table 1-2 are required to perform maintenance on the Micro Sweep.

1.5 TEST EQUIPMENT

The tools and test equipment required to perform the checkout procedure, troubleshooting, and calibration procedures are contained in table 1-2.

Table 1-2. Test Equipment

Category	Recommended Equipment	Alternate Equipment	Test Equipment Parameters
Oscilloscope	Tektronix 2465	Tektronix 453 Tektronix 475	Sensitivity: 5mV/div. Rise/Fall time: <0.05 μS. Sweep rate: 50 mS/div to 5 μs/div. Trigger: Int and Line
Spectrum Analyzer	Tektronix 492	HP 8559 HP 141T	Range: 1 to 18 GHz. Freq/Division: 10 kHz/div. Bandwidth: 3kHz.
RF Counter, Phase Locking	EIP 575		Range: 5Hz to 10 kHz and 1 to 18 GHz.
RF Power	HP 436A with HP 8484A Power Sensor	Wavetek Pacific Measurements Model 7500	Response: 1 to 18 GHz. Range: + 20 to − 40 dBm. Readout: dBm and dBref.
Digital Voltmeter	Fluke 8600A	Fluke 8050A	Range: 19 mV to 19V full scale. Resolution: 4½ digits. Accuracy: ½ LSB.
Test Generator	Wavetek 182A		
DC Voltage Source	Fluke 332B	Datel Model DCV-8500	0.0 to + 15V.
Oscilloscope Probe	Tektronix P6028	Tektronix P6101	Direct Probe (X1)
Directional Coupler	Krytar 1820	Narda 3292-1	Range: 1 to 18 GHz Coupling: − 16 dB.
Crystal Detector	HP 8470B Option 012		Polarity: Negative. Range: 1 to 18 GHz. Sensitivity: >400 μV/μW.
RF Attenuators	HP 8491B HP 8491B Option 010 HP 8491B Option 040		3dB with Type N connectors, 1 to 18 GHz. 10 dB with Type N connectors, 1 to 18 GHz.
Terminations	Tektronix 5015-1003-00		50Ω, BNC connectors.
Coaxial Adapters	Pomona Model 3285	Tektronix 103-0030-00	BNC Tee.
Coaxial Cables			50Ω BNC (M) to BNC (M). 50Ω Type N (M) to Type N (M).

SECTION 2
PREPARATION FOR USE AND INSTALLATION

2.1 MECHANICAL INSTALLATION

After unpacking the instrument, visually inspect all external parts for possible damage to connectors, surface areas, etc. If damaged, file a claim with the carrier who transported the unit. Save the shipping container and packing material in the unlikely event reshipment is required.

The Model 960 Series Micro Sweep is designed primarily for benchtop use. The instrument should be positioned so it rests upon the four rubber feet. The attached tip-up feet may be used to tilt the instrument for a better view of the front panel controls.

CAUTION

When using the instrument, do not obstruct the rear panel heatsink from normal airflow. Also, do not obstruct the top cover of the unit. Both surfaces are used to remove heat from the instrument. A confined operating environment will result in a higher than normal operating temperature and may reduce operating lifetime.

Wherever possible, place the unit in an area where air currents over the rear panel heat sink remain constant. Changes in air velocity over the heat sink will result in temperature changes at the YIG-tuned oscillator and corresponding slight frequency shifts.

2.2 ELECTRICAL INSTALLATION

2.2.1 Power Connection

NOTE

Unless otherwise specified at the time of purchase, this instrument was shipped from the factory with the power transformer connected for operation on a 120Vac line supply and with an 1 amp slow blow fuse.

Conversion to the 220 Vac input setting requires a change in rear panel fuse holder voltage card position and fuse (figure 2-1) according to the following procedure.

Card Position	Input VAC	Fuse (Slo-Blo)
100	100 to 125	1amp
120	100 to 125	1amp
220	200 to 250	1/2 amp
240	200 to 250	1/2 amp

1. Disconnect the power cord at the rear of the instrument and open fuse holder cover door. Rotate the fuse-pull level down to remove the fuse.

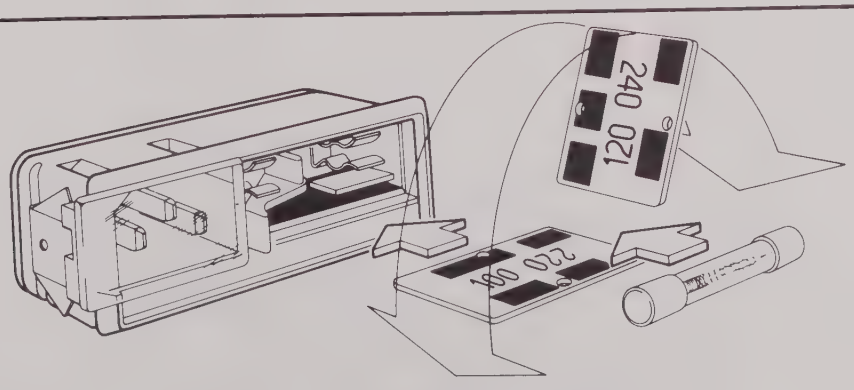


Figure 2-1. Voltage Selector and Fuse

2. Remove the small printed circuit board and select either the 120 or 220 volt positions by orienting the printed circuit board to position the desired voltage to the upper right when facing the rear of the unit. The desired voltage setting should be visible after inserting the card in the slot. Push the board firmly into its module slot.
3. Return the fuse-pull lever to the up position and insert the correct fuse into the fuse holder. Close the cover door.
4. Reconnect the power cord to the mating connector at the rear of the unit and then to the power source.

2.2.2 Signal Connection

When connecting the RF Output connector to associated equipment, use 50Ω coaxial cables equipped with male type N connectors that are compatible with those specified in U S MIL-C-39012. Use mating BNC connectors with 50Ω coaxial cable for all other input and output connections.

CAUTION

Reverse power input to the Model 960 Series in excess of 20 mW may damage the output circuits.

2.2.3 Marker Type Selection

There are two types of markers available in the 960 micro sweeps: Intensity and RF PIP. Either one of these types or both may be selected by a switch SW2 inside the micro sweep. Micro Sweeps are preset to provide Intensity and RF PIP Markers when shipped. The magnitude of the marker can be adjusted using the front panel Mkr Adj adjustment; refer to paragraph 3.1, Mkr Adj.

To select the marker.

1. Disconnect the micro sweep from the power source.
2. To remove the top cover, remove the two screws at the rear of the cover and lift the cover off. It is usually possible to set the top cover with the power supply cable still attached to the left of the Micro Sweep. If the top cover needs to be disconnected from the Micro Sweep, refer to figure 2-2.
3. Set SW2, located on the Main Board (refer to figure 2-2), for the desired marker type; refer to the following table. It may be easier to remove the WaveGen board before setting the switch SW2.

SW2 Settings

Switch Position					Marker Type
1	2	3	4*	5	
Closed	Open	Open	X	Closed	Intensity Marker only
Open	Closed	Open	X	Closed	RF PIP Marker only
Closed	Open	Closed	X	Closed	Intensity and RF PIP Markers

* Refer to paragraph 2.2.5; Tuning Filter Settings
X Do not care.

4. Connect the cables, if disconnected, and replace the top cover.

2.2.4 Z-Axis Blanking Polarity Selection

Switch SW1, located on the WaveGen board, allows selection of the Z-axis blanking pulse polarity, either positive-going (0 to + 5V) or negative-going (+ 5 to 0V) pulse. The Micro Sweeps are shipped set for positive going blanking pulses.

To select the Z-axis blanking polarity.

1. Disconnect the Micro Sweep from the power source.
2. To remove the top cover, remove the two screws at the rear of the cover and lift the cover off. Note: the power supply module is attached to the top cover and may need to be disconnected See figure 2-2.
3. Set SW1, located on the WaveGen Board, for the desired polarity; refer to the following table.

SW1 Settings

Switch Position					Z Axis Polarity
1	2	3	4	5	
NC	Closed	Open	Open	Closed	Positive-going blanking pulse
NC	Open	Closed	Closed	Open	Negative-going blanking pulse

NC Not connected.

4. Connect the cables, if disconnected, and replace the top cover.

2.2.5 Tuning Filter Selection

SW2 position 4 allows enabling or disabling of the tuning filter in the CW mode. Micro Sweeps are preset to the enabling mode (SW2-4 closed) when shipped. To disable the filter, open SW2-4.

To select the tuning filter.

1. Disconnect the Micro Sweep from the power source.
2. To remove the top cover, remove the two screw at the rear of the cover and lift the cover off. Note: the power supply module is attached to the top cover and may need to be disconnected; see figure 2-2.
3. Set SW2 position 4, located on the Main board, to Open to disable the filter (fast tuning) and to Closed to enable the filter (low residual FM).
4. Connect the cables, if disconnected, and replace the top cover.

2.3 INITIAL CHECKOUT PROCEDURE

The procedure in table 2-1 provides an initial operational checkout of all controls, connectors, and indicators located on the front and rear panels of the Micro Sweep. Each operational test requiring test equipment has the equipment interconnection illustrated and referenced in the Equipment and Setup column. The Micro Sweep Checkout Record (table 2-2) may be copied and used for a permanent record of the unit's test.

The test equipment, or its equivalent, required for the checkout procedure is listed in table 1-1.

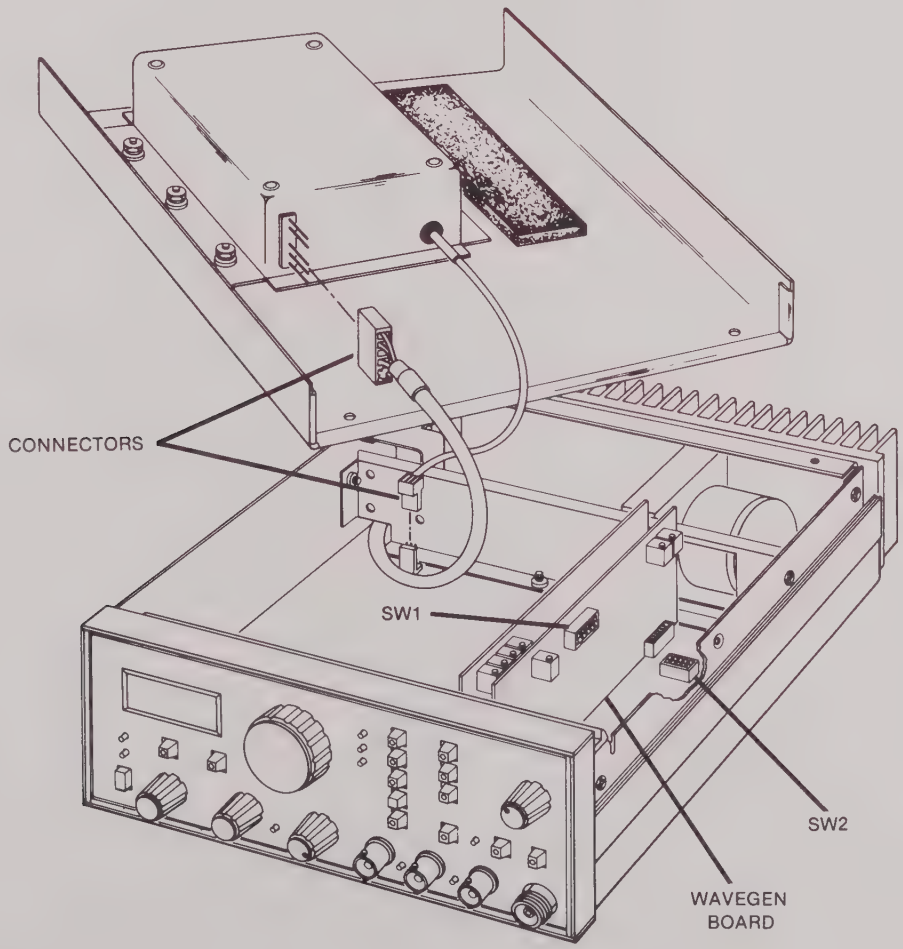


Figure 2-2. Switch Location

Table 2-1. Initial Checkout Procedure

Step	Test	Equipment/Setup	Controls and Indicators	Desired Results
1	Primary Power	None	Facility power: off.	Verify correct fuse installed. Verify correct primary voltage selected.
2		Connect Micro Sweep to facility power source.	Facility power:on. **Power** switch: On.	Line LED lit.
3	Power up conditions			CW Mode LED lit. CW indicator by main tuning knob is lit.
4	RF On		**RF On:** On. (Allow 15 minutes for Micro Sweep to warm up.)	RF On indicator is lit.
5	CW Output frequency	See figure 2-3.	Main Tuning Knob: full ccw. **Mode: CW.** **RF Level:** full cw.	Micro Sweep display reads at or below specified low end of Micro Sweep frequency range. Counter reads Micro Sweep display frequency ±1%. (Must be at or below specified low end of Micro Sweep frequency range.)
6			Main Tuning Knob: full cw.	Micro Sweep display reads at or above specified high end of Micro Sweep frequency range. Counter reads Micro Sweep display frequency ±1%. (Must be at or above specified high end of Micro Sweep frequency range.
7	Output Level Vs Frequency, Micro Sweeps without Internal Leveler (Option 001)	See figure 2-4. NOTE Account for power sensor error in order to reduce measurement errors. Do not exceed maximum input to power meter.	Main Tuning Knob: full ccw. **RF Level:** full cw. **Ext Level:** Off. **Ext Level** indicator not lit. **Lev** indicator not lit.	RF output level ≥ +12 dBm.
8			Main Tuning Knob: turn cw in 0.1 GHz (as indicated on Micro Sweep display).	RF level remains ≥ +12 dBm as frequency is varied.

Table 2-1. Initial Checkout Procedure (Continued)

Step	Test	Equipment/Setup	Controls and Indicators	Desired Results
9	Output Level Vs Frequency, Micro Sweeps with Internal Leveler (Option 001)	See figure 2-4. NOTE Account for power sensor error in order to reduce measurement errors. Do not exceed maximum input to power meter.	Main Tuning Knob: full ccw. **RF Level:** full cw. **Ext Level:** Off. **Ext Level** indicator not lit. **Lev** indicator lit.	RF output level ≥ +10 dBm.
10			Main Tuning Knob: turn cw in 0.1 GHz steps (as indicated on Micro Sweep display).	RF level remains ≥ +10 dBm as frequency is varied.
11			Main Tuning Knob: full ccw. **Ext Level:** On. **Ext Level** indicator lit. **Lev** indicator not lit.	RF output level ≥ +11 dBm.
12			Main Tuning Knob: turn cw in 0.1 GHz steps (as indicated on Micro Sweep display).	RF level remains ≥ +11 dBm as frequency is varied.
13	Output Attenuation, Micro Sweep without Internal Leveling (Option 001)		Main Tuning Knob: full ccw. **RF Level:** full ccw. **Ext Level:** Off. **Ext Level** indicator not lit. **Lev** indicator not lit.	Power meter reads at least 25 dB less than level recorded in step 7.
14	Output Attenuation, Micro Switch with Internal Leveling (Option 001)		Main Tuning Knob: full ccw. **RF Level:** full ccw. **Ext Level:** Off. **Ext Level** indicator not lit. **Lev** indicator lit.	Power meter reads at least 7dB less than level recorded in step 10.

Table 2-1. Initial Checkout Procedure (Continued)

Step	Test	Equipment/Setup	Controls and Indicators	Desired Results
15	External Level Control	See figure 2-5. NOTE Account for power sensor error in order to reduce measurement errors. Do not exceed maximum input to power meter.	Main Tuning Knob: full ccw. **RF Level:** full cw. **Ext Level:** On. **Ext Level** indicator lit. **Lev** indicator lit.	Note RF output level reading.
16			Main Tuning Knob: turn cw in 0.1 GHz steps (as indicated on Micro Sweep display).	RF level varies less than ±1 dB as frequency is varied.
17	Sweep Out Ramp	See figure 2-6.	**Mode: S/S Swp.** **Start:** full ccw. **Stop/ΔF:** full cw. **Swp Time:** full cw.	Oscilloscope displays approximately ≤20 ms sweep time. See figure 2-7.
18			**Swp Time:** full ccw. NOTE If this control is accidentally placed in the Ext Tune position, the unit reverts to the CW mode.	Oscilloscope displays approximately ≥20 second sweep time.
19	S/S Sweep	See figure 2-8.	**Mode: S/S Swp** (indicator lit). **Start:** full ccw. **Stop/ΔF:** full cw. **Swp Time:** full cw.	Oscilloscope verifies Start/Stop frefrequency sweep. See figure 2-9.
20			**Start:** rotate cw; return to full ccw.	Start frequency increases; sweep range decreases.
21			**Stop/ΔF:** rotate ccw; return to full cw.	Stop frequency decreases; sweep range decreases.

Table 2-1. Initial Checkout Procedure (Continued)

Step	Test	Equipment/Setup	Controls and Indicators	Desired Results
22	Markers	See figure 2-8.	**Start:** full ccw. **Stop/ΔF:** full cw. **M1:** press (indicator flashes at low duty cycle). **On/Off:** press once (M1 flashes at high duty cycle). **Update:** press Main Tuning Knob: ccw to lower end of band.	Oscilloscope displays marker number 1 on left half of trace; see figure 2-9. Note It may be necessary to adjust the Mkr Adj or the marker polarity for proper display. Refer to paragraph 2.2.4.
23			**M2:** press (indicator flashes at low duty cycle). M1 indicator on continuously. **On/Off:** press once (M2 flashes at high duty cycle). **Update:** press Main Tuning Knob: cw to upper end of band.	Oscilloscope displays marker number 2 on right half of trace; see figure 2-9.
24			**M3:** press (indicator flashes at low duty cycle). M1 and M2 indicator on continuously. **On/Off:** press (M3 flashes at high duty cycle). **Update:** press Main Tuning Knob: near center of frequency band.	Oscilloscope displays marker number 3 near center of trace; see figure 2-9.
25	ΔF Sweep		**Mode: ΔF Swp.** Main Tuning Knob: center of frequency band. **Display Stop/ΔF:** press **Stop/ΔF:** center of range.	Oscilloscope verifies ΔF sweep. Marker number 3 appears in the center of the trace; see figure 2-10.

Table 2-1. Initial Checkout Procedure (Continued)

Step	Test	Equipment/Setup	Controls and Indicators	Desired Results
26	ΔF Sweep	See figure 2-8.	**Stop/ΔF:** rotate cw.	Sweep range increases as verified on oscilloscope.
27			**Stop/ΔF:** rotate ccw.	Sweep range decreases as verified on oscilloscope.
28	External Trigger	See figure 2-11.	**Mode: ΔF Swp.** Main Tuning Knob: center of frequency band. **Stop/ΔF:** full cw. **Ext Trig:** On (indicator lit). **Swp Time:** full cw.	Oscilloscope verifies externally triggered ΔF sweep.
29	Single Sweep	Figure 2-11 without TTL source TRIG IN.	**Ext Trig:** On. **Sweep Time:** center of range (12 o'clock). **Ext Trig:** press twice.	Ext Trig indicator is lit. Oscilloscope displays a single trace each time Ext Trig is pressed twice.
30	External Frequency Modulation	Set up as shown in figure 2-12.	**Mode: CW.** Main Tuning Knob: center of frequency band.	Spectrum analyzer verifies 1kHz FM signal.
31	External Amplitude Modulation	Set up as shown in figure 2-13.	**Mode: CW.** Main Tuning Knob: center of frequency band. **RF Level:** cw.	Oscilloscope displays square wave with frequency of 1kHz. (Adjust RF Level to obtain desired detection range on oscilloscope.)
32	External Frequency Control	Set up as shown in figure 2-14. DC Source: 0V	**Swp Time:** extreme ccw (Ext Tune).	Ext Tune indicator lit. Micro Sweep display reads low end of unit's frequency range.
33		DC Source: +10 ±.02V.		Micro Sweep display reads high end of unit's frequency range.

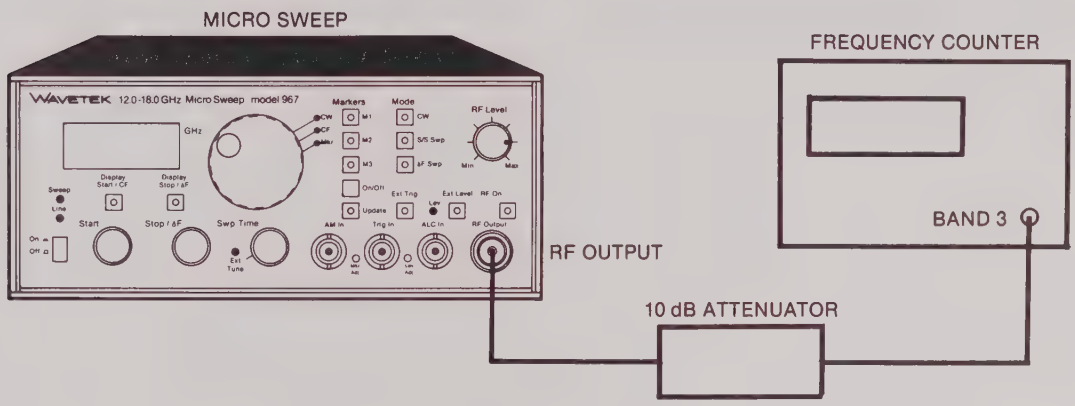


Figure 2-3. Frequency Measurement Setup

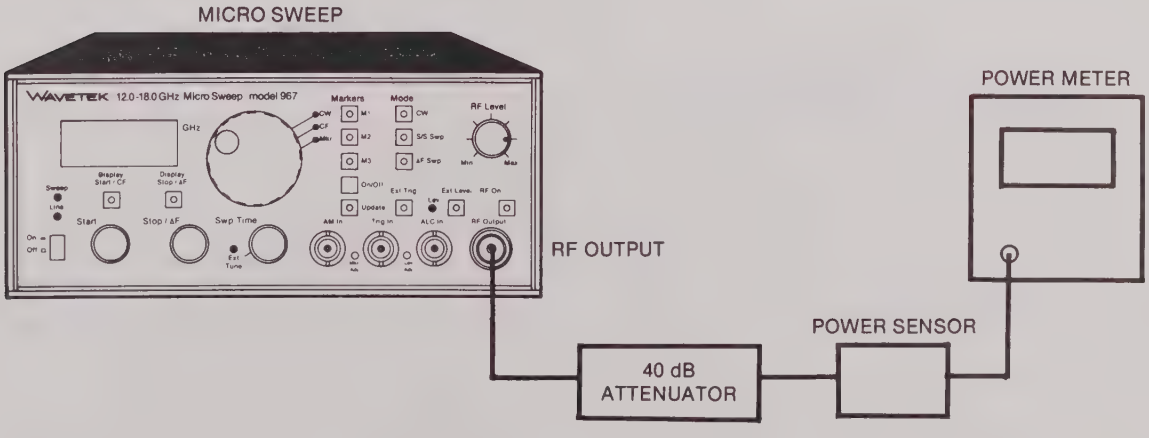


Figure 2-4. Output Level Measurement Setup

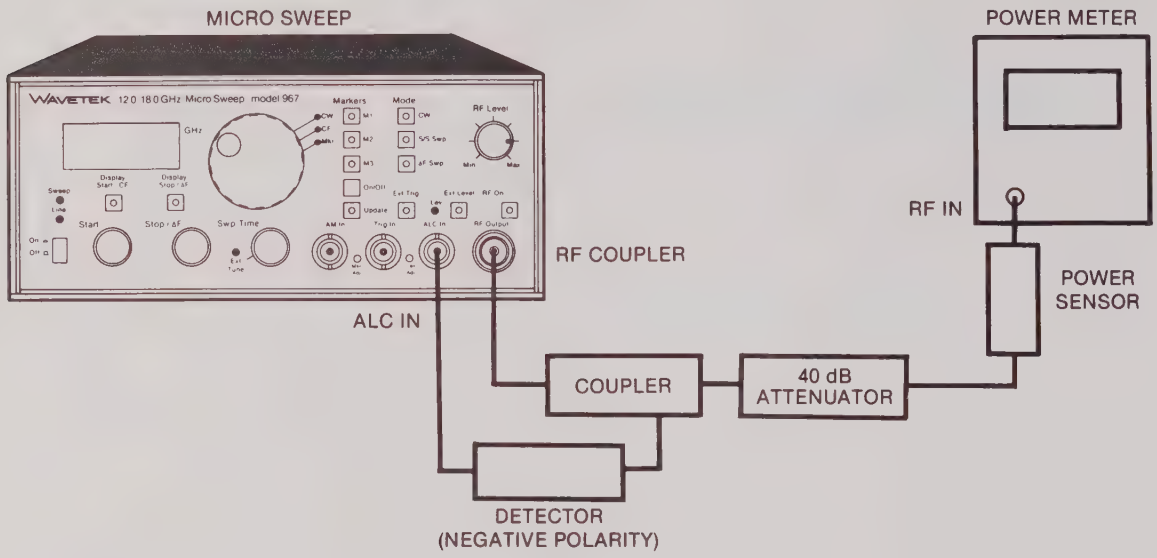


Figure 2-5. External Level Control Setup

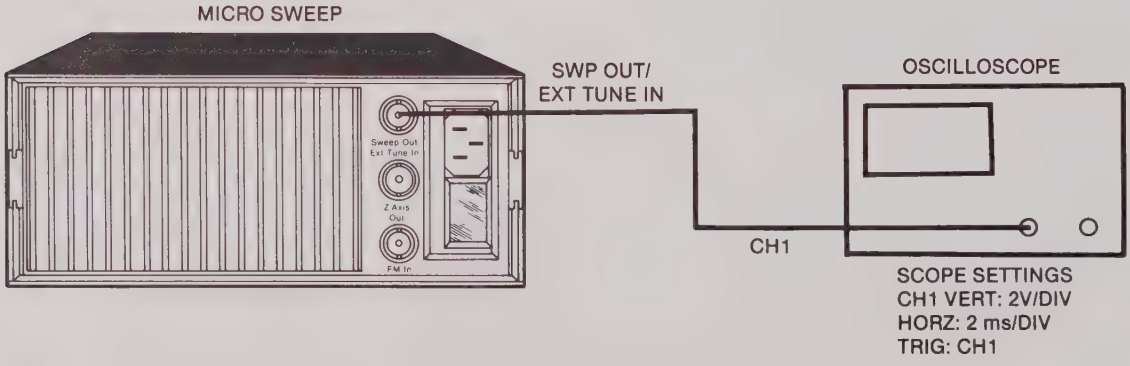


Figure 2-6. Sweep Ramp Setup

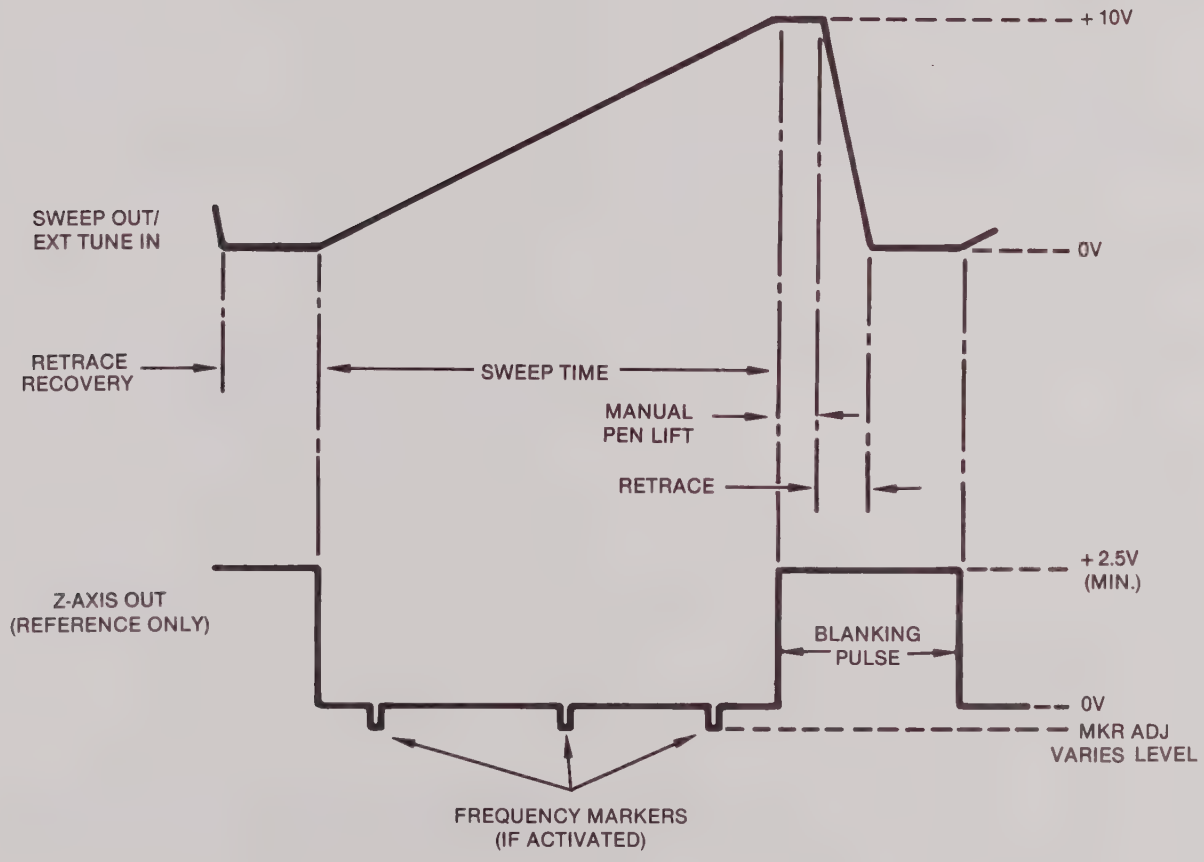


Figure 2-7. Sweep Ramp and Blanking Pulse Output

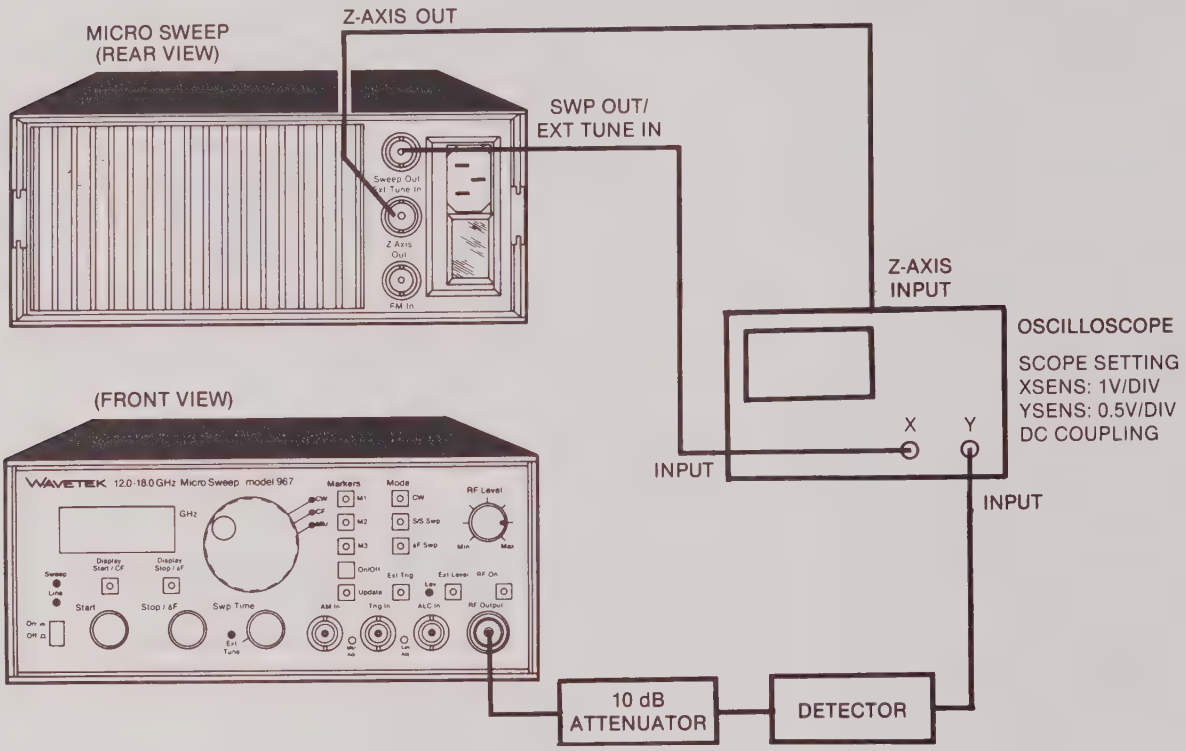


Figure 2-8. Start/Stop Sweep Setup

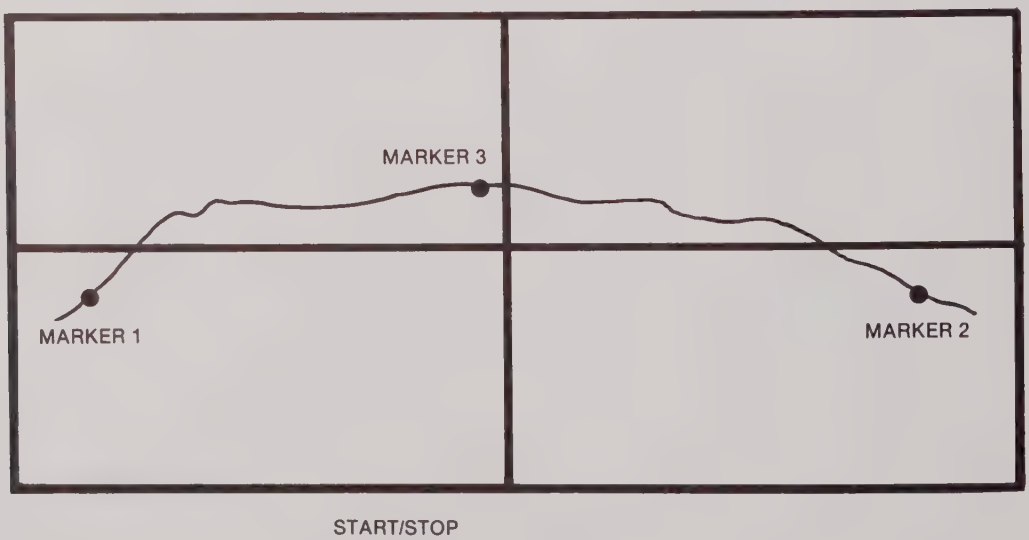


Figure 2-9. Sweep Trace

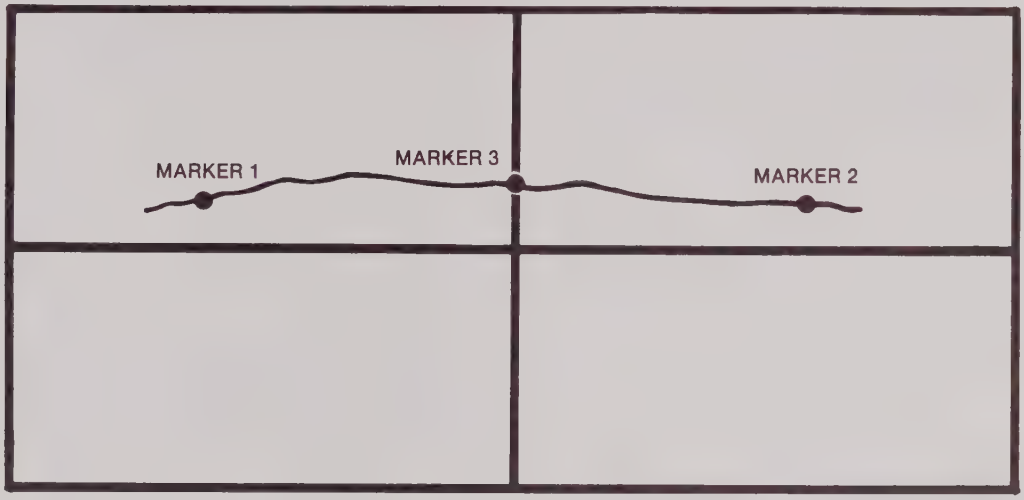


Figure 2-10. ΔF Sweep Trace

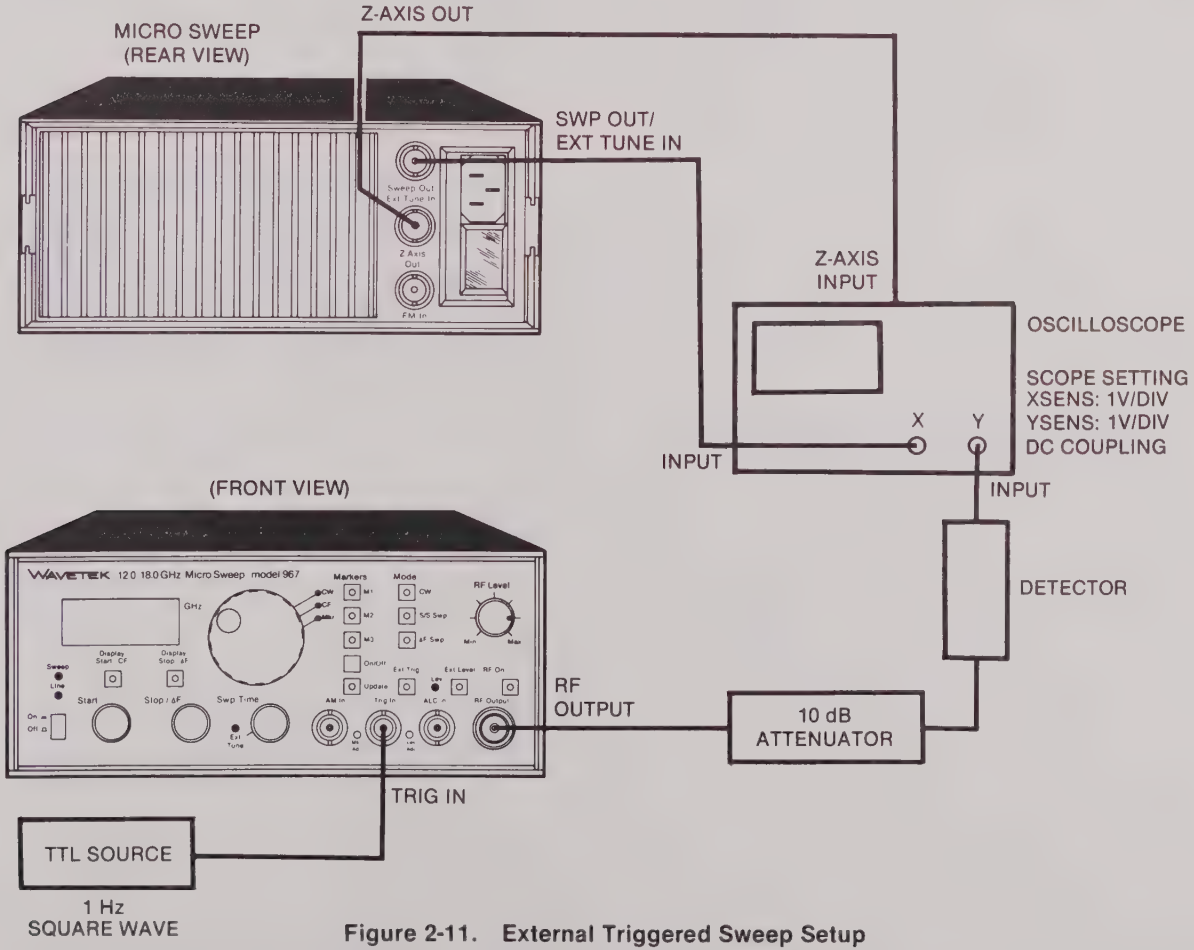


Figure 2-11. External Triggered Sweep Setup

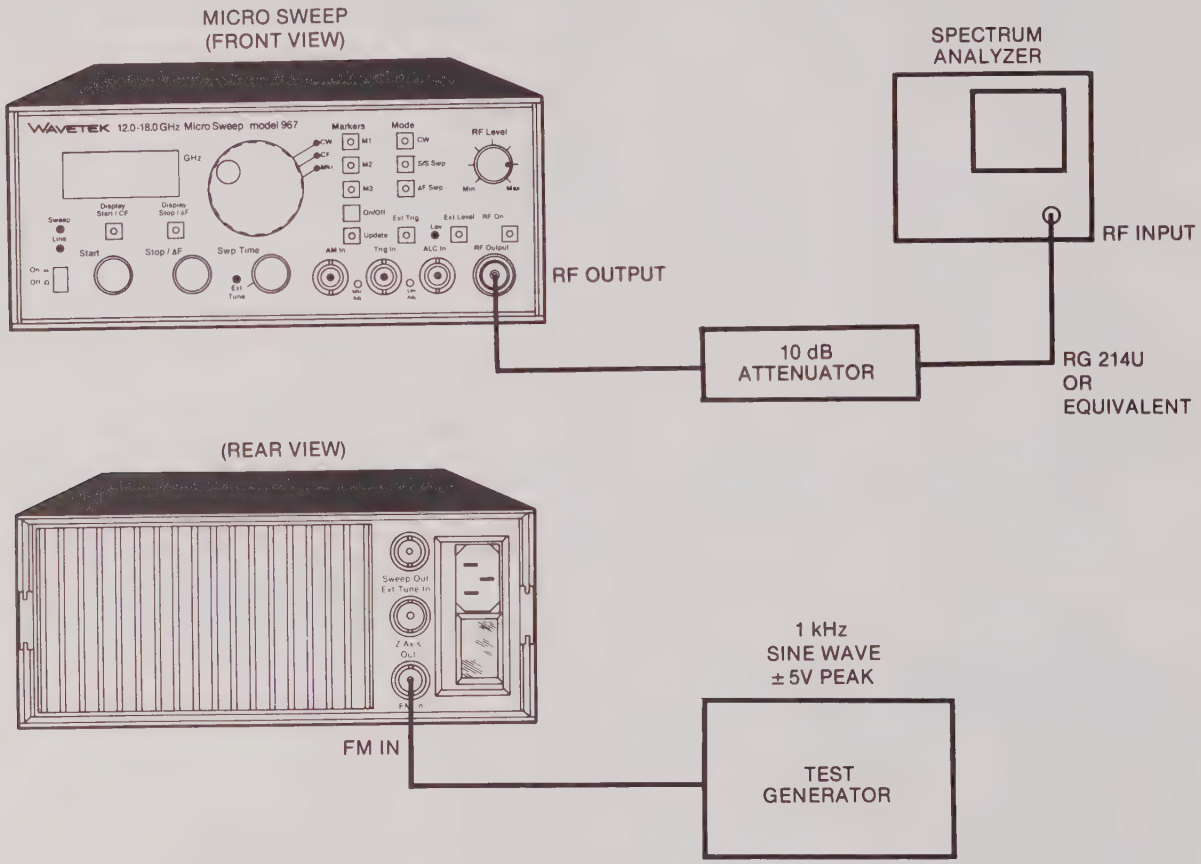


Figure 2-12. External Frequency Modulation Setup

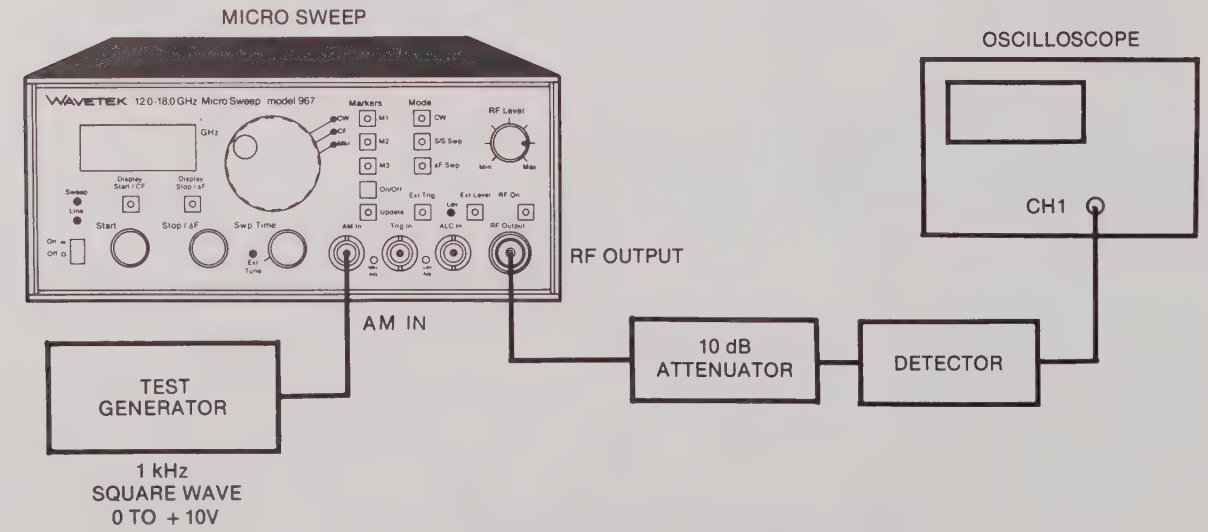


Figure 2-13. External Amplitude Modulation Setup

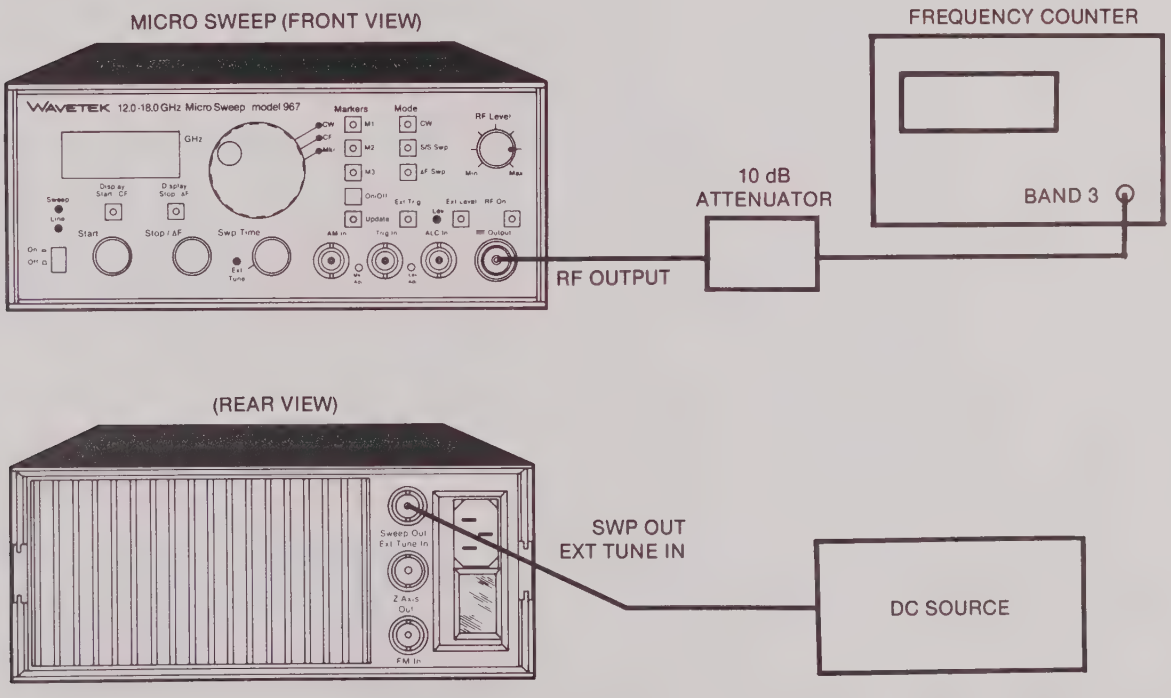


Figure 2-14. External Frequency Control Setup

Table 2-2. Micro Sweep Checkout Record

Step (Table 2-1)	Desired Results	Acceptable (✓)
1	Correct fuse installed. Correct voltage selected.	_____ _____
2	Line LED lit.	_____
3	CW indicators lit.	_____
4	RF LED indicator is lit.	_____
5	Micro Sweep tunes to low end of frequency range. Counter reads Micro Sweep frequency ±1%.	_____
6	Micro Sweep tunes to high end of frequency range. Counter reads Micro Sweep frequency ±1%.	_____
7	Micro Sweep without Internal Leveler. RF output level ≥ +12 dBm.	_____
8	Micro Sweep without Internal Leveler. RF level remains ≥ +12 dBm (minimum).	_____
9	Micro Sweep with Internal Leveler. RF output level ≥ +10 dBm.	_____
10	Micro Sweep with Internal Leveler. RF level remains ≥ +10 dBm.	_____
11	Micro Sweep with Internal Leveler; Internal leveler off. RF output level ≥ +11 dBm.	_____
12	Micro Sweep with Internal Leveler; Internal leveler off. RF level remains ≥ +11 dBm.	_____
13	Micro Sweep without Internal Leveler or Micro Sweep with Internal leveler off. RF power meter reads at least 25 dB less than step 7.	_____
14	Micro Sweep with Internal Leveler. RF power meter reads at least 7dB less than in step 10.	_____
15	Note RF output level reading.	_____
16	RF level varies ≤ ±1 dB of reading in step 15.	_____

Table 2-2. Micro Sweep Checkout Record (Continued)

Step (Table 2-1)	Desired Results	Acceptable (✓)
17	Oscilloscope verifies approximately ≤20 ms sweep time.	
18	Oscilloscope verifies approximately ≥20 second sweep time.	
19	Oscilloscope verifies Start/Stop frequency sweep.	
20	Start frequency increases. Sweep range decreases.	
21	Stop frequency decreases. Sweep range decreases.	
22	Oscilloscope displays Marker 1	
23	Oscilloscope displays Marker 2	
24	Oscilloscope displays Marker 3	
25	Oscilloscope verifies ΔF Sweep.	
26	Sweep range increases as verified on oscilloscope.	
27	Sweep range decreases as verified on oscilloscope.	
28	Oscilloscope verifies External Trigger.	
29	Oscilloscope verifies manual single sweep.	
30	Spectrum Analyzer verifies 1kHz FM signal.	
31	Oscilloscope displays 1kHz square wave.	
32	Frequency counter and Micro Sweep display read low end of Micro Sweep frequency range.	
33	Frequency counter and Micro Sweep display read high end of Micro Sweep frequency range.	

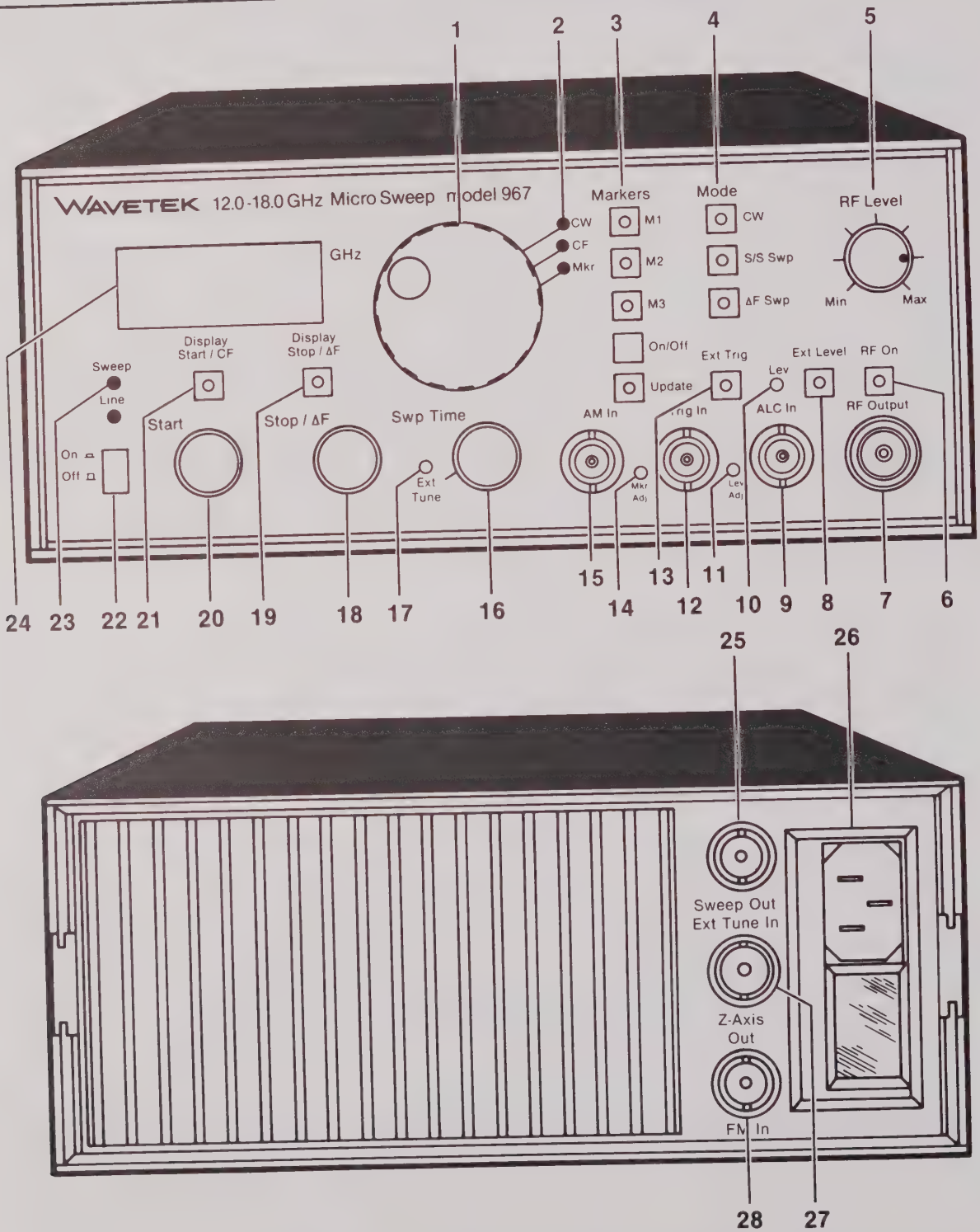


Figure 3-1. Controls, Connectors, and Indicators

SECTION 3
OPERATION

3.1 CONTROLS, CONNECTORS, AND INDICATORS

The Micro Sweeps front and rear panel controls, indicators, and connectors are shown in figure 3-1 and keyed to the following description.

1 Main Tuning Knob

This ten-turn manual frequency control knob sets three different types of frequency parameters, depending upon the operating and display mode of the instrument.

In the CW mode, it tunes the frequency of the microwave oscillator. In the ΔF sweep mode, the control sets the center frequency (CF) of the symmetrical sweep.

When a marker (M1 through M3) has been selected and the Update pushbutton **3** has been pressed, this control set the marker frequency.

Selecting the start/stop sweep mode (S/S Swp) or external tune (Ext Tune) disables the main tuning knob.

The three LED indicators to the right of the main tuning knob indicate which frequency parameter is being controlled by the knob.

2 Tuning Indicators

CW This red LED is illuminated when in the CW mode. The Main Tuning Knob **1** tunes the frequency of the microwave oscillator in the CW mode.

CF (Center Frequency) This red LED is illuminated when in the ΔF Sweep mode. The Main Tuning Knob **1** controls the center frequency in ΔF sweep.

Mkr (Marker) This red LED is illuminated when the Main Tuning Knob **1** is used to update any marker frequency. It is activated whenever the Update **3** switch is toggled on. For a marker frequency to be updated, a marker must have first been selected by pressing any of the switches M1 through M3. The Mkr LED may be on simultaneously with the CW or CF LED.

3 Marker Switches

M1 (Marker 1) This momentary contact pushbutton switch and integrated red LED indicator are used to select marker number 1 for frequency display and status change via the On/Off or Update switches. Pressing the switch displays the frequency of Marker 1 on the LCD readout, enables status change, and causes the LED to blink. If the selected marker 1 is on, the blink has a long duty cycle (mostly on). If the marker 1 is off, the blink has a short duty cycle (mostly off). If the marker is on but not selected for change, the LED is illuminated without blinking.

M2 (Marker 2) This switch and indicator functions exactly the same as the M1 marker switch and indicator, except Marker 2 is selected.

M3 (Marker 3) This switch and indicator functions exactly the same as the M1 marker switch and indicator, except Marker 3 is selected.

On/Off This momentary contact pushbutton switch changes the on/off status of a selected marker. If the selected marker is off, blinking with a mostly off (short duty) cycle, pressing the On/Off switch will turn on the marker and the blink duty cycle will become long (mostly on). If the selected marker is on, pressing the On/Off switch will turn the marker off.

Update This momentary contact pushbutton switch with integrated LED indicator activates the marker frequency tuning mode after a marker has been selected. Pressing this switch allows the Main Tuning Knob **1** to update the frequency of the selected marker. The marker update mode is indicated by the glowing LED indicator within the switch and the Mkr LED next to the Main Tuning Knob **1**. Pressing any other front panel pushbutton switch cancels the marker update mode. If the Update switch is pressed without a marker being selected, the Update indicator will glow, but no marker frequencies will be changed.

4 **Mode Switches and Indicators**

CW This momentary contact pushbutton switch with integrated LED indicator selects and indicates the CW mode of operation. Pressing the switch selects the CW tuning mode. When the CW mode has been selected, the LED inside the switch is illuminated. The CW mode is also indicated by the CW LED **2** to the right of the Main Tuning Knob **1**. When the unit has been placed into the external tune (Ext Tune) mode, the CW mode is automatically selected and the LED indicators glow. Selecting the CW or external tuning mode of operation also switches a filter into the microwave oscillator tuning circuit which improves the residual FM performance. This filter reduces the response of the oscillator to rapid changes in frequency during the CW mode. The tuning filter can be disabled by a switch within the instrument; refer to paragraph 2.2.5.

S/S Swp This momentary contact pushbutton switch with integrated LED indicator selects and indicates the Start/Stop Sweep mode. Pressing the switch selects the Start/Stop mode. When the Start/Stop mode has been selected, the LED inside the switch is illuminated.

ΔF Swp This momentary contact pushbutton switch with integrated LED indicator selects and indicates the ΔF Sweep mode of operation.

5 **RF Level Control** This single turn manual control knob sets the RF output Power level. When rotated cw, the RF output level is increased. When rotated ccw, the RF output level is decreased.

6 **RF On** The momentary pushbutton and LED indicator enables or disables the signal at RF Output **7**. If the indicator is illuminated, the RF output is on; if the indicator is out the RF output is off (the actual YIG oscillator is shut off).

7 **RF Output** This N-Type connector provides a 50Ω output for the RF signal from the instrument.

8 **Ext Level** This momentary pushbutton and LED indicator switches the unit to accept a leveling input from the front panel ALC In BNC **9**. If the LED is not glowing, the unit attempts to level with the internal leveling option, if installed.

9 **ALC In** This connector accepts a signal input which, when Ext Level **8** is selected, is used to level the RF output across the frequency band.

10 **Lev** An illuminated LED indicates that the RF output signal is leveled either internally or externally.

11 **Lev Adj** This screwdriver adjustment allows adjustment of the leveling loop gain. It has been factory preset for optimal leveling loop operation. When using different couplers and detectors, the Lev Adj may require further adjustment to optimize leveling loop performance and to prevent leveling loop oscillation.

12 **Trig In** This input allows external triggering of the sweep. Sweep is triggered by the falling edge of a TTL signal or contact closure to ground.

13 **Ext Trig** This momentary pushbutton with LED indicator selects either externally triggered sweep or auto-triggered sweep. When external trigger is selected (Ext Trig indicator lit), an external trigger signal or contact closure at the Trig In connector **12** triggers the sweep. Double pressing of this pushbutton at slower sweep rates permits single sweep operation. When auto-trigger is selected (Ext Trig indicator extinguished), the frequency is continuously swept.

14 **Mkr Adj** This front panel screwdriver adjustment adjusts the magnitude of the markers. If intensity markers are used, this control adjusts the relative brightness of the markers. If RF PIP markers are used, this control adjusts the depth of the PIP. When both markers types are used, the adjustment only affects the brightness of the intensity marker.

15 **AM In** This BNC connector provides an input port for external AM signals. A dc input at this port will remotely control the Micro Sweep's RF output level.

16 **Swp Time** This control sets the sweep time for the S/S Swp and ΔF Swp modes. The sweep time can be varied between 0.02 to 20 seconds, nominal. In addition, a detent position (Ext Tune) allows an analog signal at the Swp Out/Ext Tune In connector **25** (rear panel) to control the oscillator frequency; the unit is automatically switched to the CW mode.

17 **Ext Tune** This LED, when lit, indicates the Swp Time control **16** is set to the Ext Tune position.

18 **Stop/ΔF** This single turn control sets either the stop frequency (S/S Swp mode) or ΔF frequency (ΔF Swp mode) depending on the sweep mode as determined by the Mode switches **4**.

19 **Display Stop/ΔF** This momentary pushbutton (indicator lit) causes the display to show either the stop frequency (S/S Swp mode) or ΔF frequency (ΔF Swp) depending on the existing sweep mode. The Display Stop/ΔF pushbutton has no affect in the CW mode.

20 **Start** This control sets the start frequency in the S/S Swp mode.

21 **Display Start/CF** This momentary pushbutton (indicator lit) causes the display to show either the start frequency (S/S Swp mode) or CF frequency (ΔF Swp mode). The Display Start/CF indicator will light automatically when the S/S Swp mode or the ΔF Swp mode is initially selected.

22 **Power On/Off** This pushbutton controls the primary power to the unit. When the power is on the Line LED indicator is lit. When the power is off the Line LED indicator is extinguished.

23 **Sweep** This indicator lights for the duration of the sweep in the S/S Swp and ΔF Swp modes.

24 **(Frequency) GHz** This 3½ digit liquid crystal display (LCD) indicator displays the CW frequency (CW mode), start or stop frequency (S/S Swp mode), and center and ΔF frequencies (ΔF Swp mode). It also can be switched to display the frequencies of markers 1 through 3 and the externally tuned frequency.

25 **Swp Out/Ext Tune In** This rear panel BNC connector serves two functions depending upon the setting of the Swp Time **16** control. For internal sweep modes, this connector supplies a 0 to +10V direct-coupled, modified sawtooth waveform. The Swp Time control can be in any position except Ext Tune (detent). The signal limits are 0V (sweep beginning) and +10V (sweep end) regardless of sweep width, rate or direction. In the internal CW mode, the output is proportional to the frequency with linear 0 to +10V, nominal, for full instrument bandwidth.

When the Swp Time control is set to the Ext Tune position (detent), this connector accepts a 0 to +10V input level that tunes the microwave oscillator from the bottom of the band to the top of the band respectively.

26 **Power cord connector** This combination connector provides a line voltage selector and fuse holder as well as a connector for a modular line cord.

27 **Z-Axis Out** This BNC connector provides the rectangular marker (Intensity Marker) pulse and retrace blanking pulse for Z-Axis input to CRT display units. The polarity of the marker output is factory set to a negative pulse with a corresponding positive blanking pulse. The pulse may be changed to the opposite polarity by an internal switch; see paragraph 2.2.4.

28 **FM In** This rear panel BNC connector provides an input port for external FM or phase-lock feedback signals.

3.2 OPERATION

The following paragraphs describes how to use the 960 Series Micro Sweep. All bold numbers in the text refer to the individual controls and connectors described in paragraph 3.1. Also, paragraph 2.3 and table 2-1 provides an excellent hands-on method of understanding the 960s' operation.

3.2.1 CW Operation

In the CW mode, the Micro Sweep supplies a single frequency at the RF Output connector **7**. The main tuning knob **1** sets the output frequency. The signal can be FM modulated (FM, see paragraph 3.2.8), and AM modulated (AM, see paragraph 3.2.7). The External Tuning mode is similar to the CW mode except the frequency is controlled by an external signal. Figure 3-2 illustrates the control settings and equipment setup for the CW mode.

The following list gives the controls and connectors required for the CW operating mode.

Control/Connector	Operation
Power **22**	Press to turn unit on. Line LED is lit.
RF On **6**	Press to On (indicator lit) to enable RF signal at RF Output.
RF Level **5**	Set RF level at RF Output connector to desired output level.
Mode **4**	Press CW pushbutton (indicator lit) to select CW (if necessary).
LCD Display **24**	Shows output frequency.

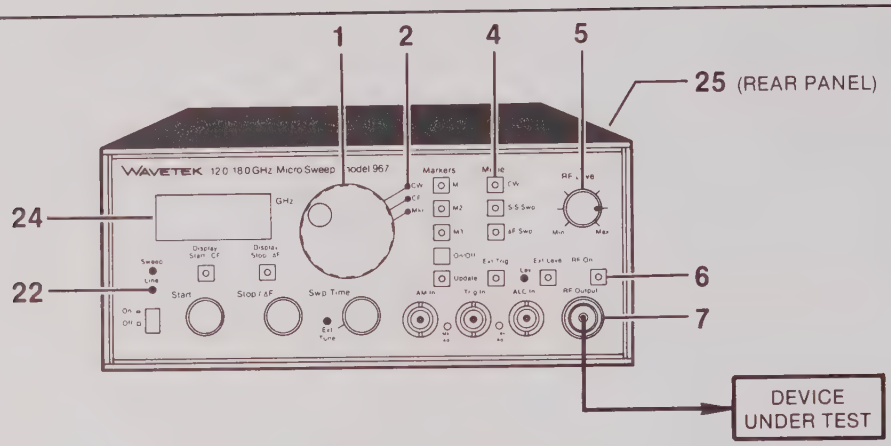


Figure 3-2. CW Operation

Control/Connector	Operation
CW LED **2**	Lit indicates that main tuning knob controls the CW frequency.
Main Tuning Knob **1**	Sets output frequency. Rotate cw to increase frequency and ccw to decrease frequency. Rotate cw to increase output level and ccw to decrease.
RF Output **7**	Signal output from the unit. 50Ω source impedance.
Swp Out/Ext Tune In (Rear Panel) **25**	A 0 to +10V dc level proportional to the output frequency main tuning knob).

3.2.2 Start/Stop Sweep

In Start/Stop Sweep (S/S Swp), the frequency sweeps linearly between a set Start frequency and a set Stop frequency. The Start knob **20** controls the start frequency, and the Stop/ΔF knob controls the stop frequency. The Display Start/CF **21** and Display Stop/ΔF **19** selects either the Start or Stop frequency for display. The Swp Time (Sweep Time) knob **16** sets the sweep rate. Frequency markers can be used with Start/Stop Sweep; refer to paragraph 3.2.5. Figure 3-3 illustrates the controls and equipment setup for the Start/Stop Sweep operation.

The following list gives the controls and connectors required for the Start/Stop Sweep operating mode.

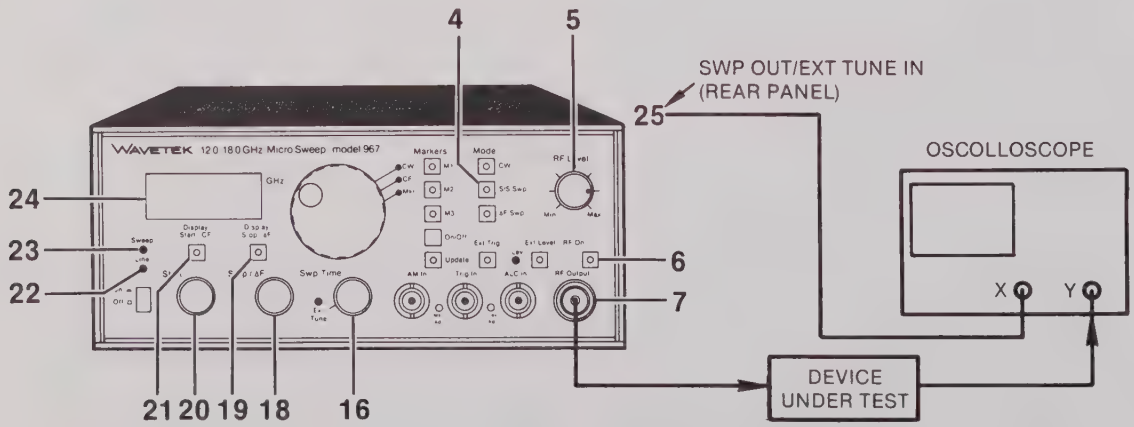


Figure 3-3. Start/Stop Sweep Operation

Control/Connector	Operation
Power **22**	Press to turn unit on. Line LED is lit.
RF On **6**	Press to On (indicator lit) to enable RF signal at RF Output.
RF Level **5**	Set RF level at RF Output connector. Rotate cw to increase output level and ccw to decrease.
RF Output **7**	Signal output from the unit. 50Ω source impedance.
Mode **4**	Press S/S Swp pushbutton (indicator lit) to select Start/Stop Sweep mode.
Display Start/CF **21**	Press to display Start frequency (indicator lit); this pushbutton need not be pressed if the indicator is lit.
LCD Display **24**	Shows the start frequency.
Start **20**	Sets the start frequency. Rotate cw to increase the frequency, and rotate ccw to decrease the frequency. Downward sweeps are permitted.
Display Stop/ΔF **19**	Press to display Stop frequency (indicator lights); this pushbutton need not be pressed if the indicator is lit.
LCD Display **24**	Shows the stop frequency.
Stop/ΔF **18**	Sets the stop frequency. Rotate cw to increase frequency and ccw to decrease frequency.
Swp Time **16**	Set the sweep rate; can be varied between 0.02 (cw position) to 20 (ccw position) seconds per sweep. Do not rotate the switch to the detent position (Ext Tune).
Sweep LED **23**	Blinks at sweep rate.
Swp Out/Ext Tune In (rear panel) **25**	A 0 to + 10V dc coupled, modified sawtooth wave; see figure 3-4.

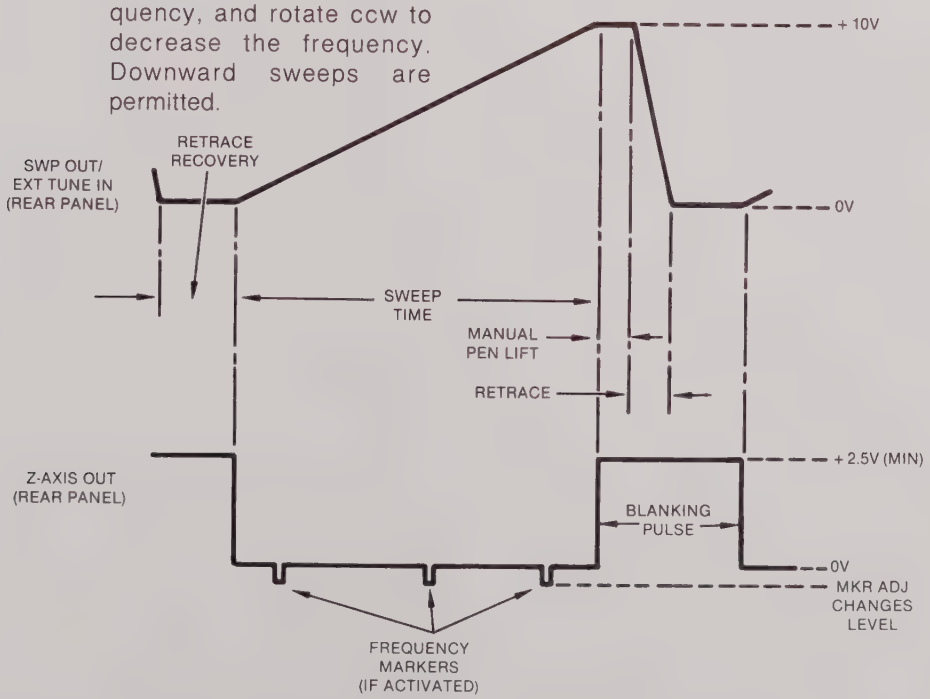


Figure 3-4. Sweep Sawtooth and Blanking Pulse Output

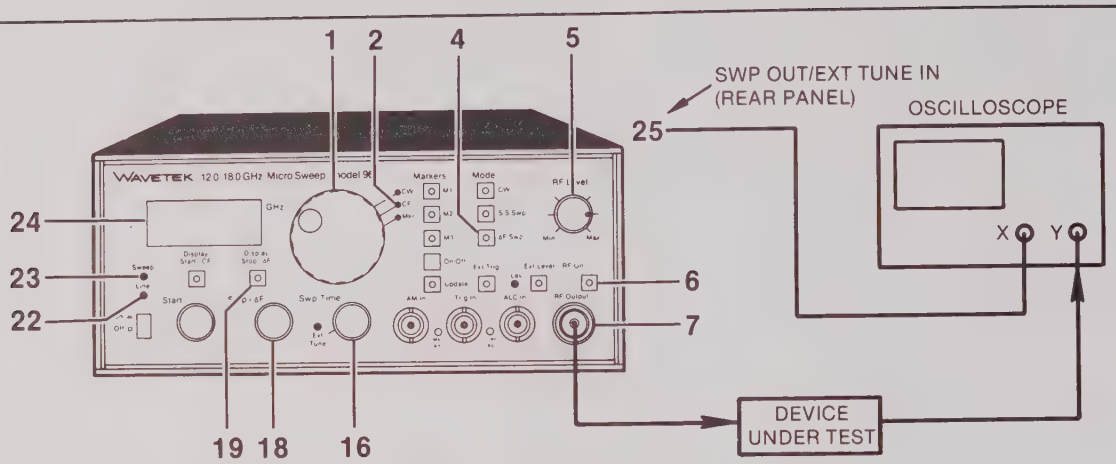


Figure 3-5. ΔF Sweep Operation

3.2.3 ΔF Sweep

In the ΔF Sweep mode, the frequency sweeps symmetrically upward centered on the center frequency (CF). The Main Tuning knob **1** sets the center frequency, while the Stop/ΔF knob **18** sets the total frequency deviation. The Swp Time knob controls the sweep rate. Frequency markers can be used with ΔF Sweep; refer to paragraph 3.2.5. Figure 3-5 indicates the primary controls for the ΔF Sweep operation.

The following list gives the controls and connectors required for the ΔF Sweep operating mode.

Control/Connector	Operation
Power **22**	Press to turn unit on. Line LED is lit.
RF On **6**	Press to On (indicator lit) to enable RF signal at RF Output.
RF Level **5**	Set RF level at RF Output connector. Rotate cw to increase output level and ccw to decrease.
RF Output **7**	Signal output from the unit. 50Ω source impedance.
Mode **4**	Press ΔF Swp pushbutton (indicator lit) to select ΔF Sweep mode. CF LED **2** is lit.
Display Start/CF **21**	Press to display center frequency (indicator lit); this pushbutton need not be pressed if the indicator is lit.
LCD Display **24**	Shows the center frequency.
Main Tuning Knob **1**	Sets the center frequency. Rotate cw to increase frequency and ccw to decrease frequency.
Display Stop/ΔF **19**	Press to display total frequency deviation (indicator lights).
LCD Display **24**	Shows the total frequency deviation.
Stop/ΔF **18**	Sets the total frequency deviation. Rotate cw for maximum deviation and ccw for minimum deviation.
Swp Time **16**	Sets the sweep rate; can be varied between 0.02 (cw position) to 20 (ccw position) seconds. If the Swp Time switch is accidentally placed in the Ext Tune position, the unit reverts to the CW mode.
Sweep LED **23**	Blinks at sweep rate.
Swp Out/Ext Tune In (rear panel) **25**	A 0 to +10V dc coupled, modified sawtooth wave; see figure 3-4.

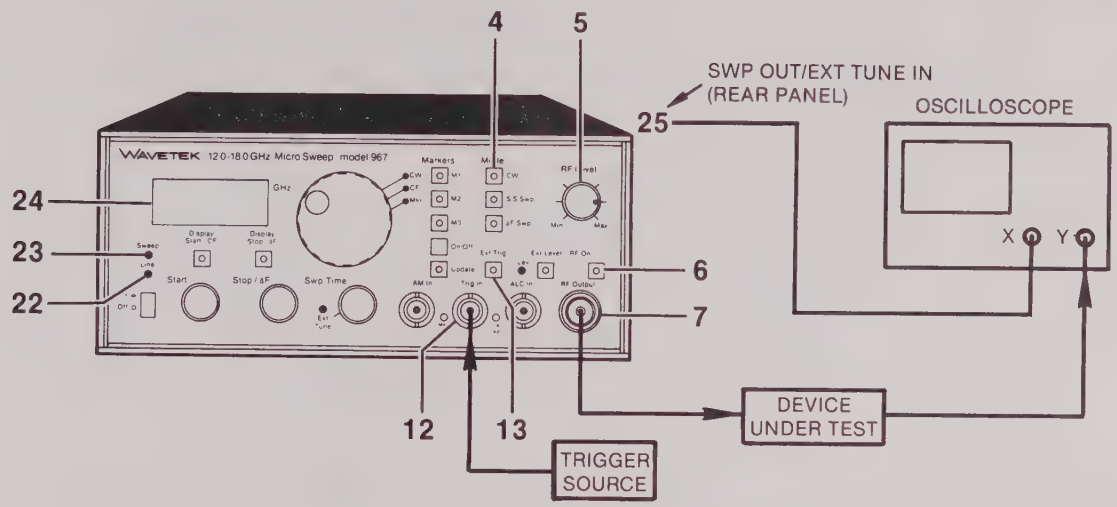


Figure 3-6. External Triggered Sweep Operation

3.2.4 External Triggered Sweep

The unit may be externally triggered by applying an signal at the Trig In BNC or manually triggered using the Ext Trig pushbutton. When triggered, the unit sweeps, either Start/Stop Sweep or ΔF Sweep, one time and returns to the original point. Figure 3-6 shows the controls and connectors required for the external triggered sweep mode.

The following list gives the controls and connectors required for triggered sweep.

Control/Connector	Operation
Power **22**	Press to turn unit on. Line LED is on.
RF On **6**	Press to On (indicator lit) to enable RF signal at RF Output.
RF Level **5**	Set RF level at RF Output connector. Rotate cw to increase output level and ccw to decrease.
RF Output **7**	Signal output from the unit. 50Ω source impedance.
Mode **4**	Select the desired sweep mode. For Start/Stop Sweep, refer to paragraph 3.2.2. For ΔF Sweep, refer to paragraph 3.2.3.
Ext Trig **13**	Press to select externally triggered sweep, indicator is lit.
Trig In **12**	To initiate a triggered sweep, apply a high to low TTL signal or contact closure to ground.

To manually trigger the sweep in external trigger, press the Ext Trig pushbutton twice. In order to effectively manually trigger, the sweep time must be slower than the rate at which the pushbutton is pressed. There is an initial retrace recovery delay before the sweep begins.

3.2.5 Frequency Markers

The Micro Sweep can supply up to three constant width frequency markers for CW, Start/Stop Sweep, ΔF Sweep, and Remote frequency control. Each marker is independently adjustable over the entire frequency band. The unit supplies two types of markers: Oscilloscope Z-Axis Intensity and Amplitude (RF PIP). The marker type can be selected using an internal switch; refer to paragraph 2.2.3. Frequency markers are provided only when the sweep is from a lower to higher frequency.

Intensity markers, a rectangular pulse, provides a marker signal for Z-axis input to oscilloscopes. The marker pulse is factory set for a negative-going pulse (⊔), but may be changed to positive-going pulse (⊓) using an internal switch; refer to paragraph 2.2.4. Retrace blanking signal will be of the opposite polarity.

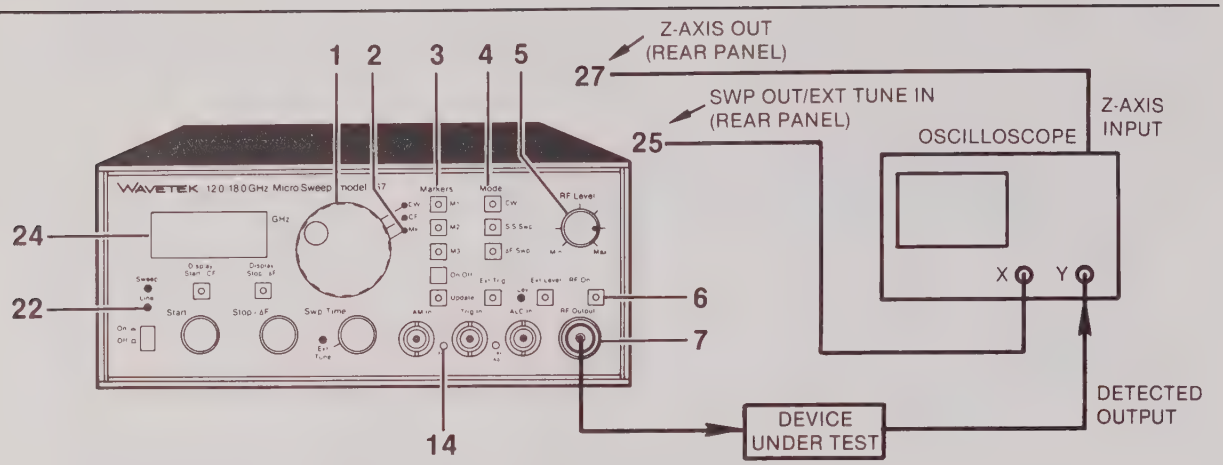


Figure 3-7. Frequency Markers Operation

Amplitude (RF PIP) marker is generated by momentarily reducing the RF output. The factory set position enables the amplitude marker, however, it can be disabled with an internal switch; refer to paragraph 2.2.4.

Figure 3-7 shows the controls required to set the frequency markers. Controls required to set Start/Stop Sweep or ΔF Sweep are described in paragraphs 3.2.2 and 3.2.3 respectively.

The following list gives the controls and connectors required to set frequency markers. There is a specific order to selecting, enabling, and changing the markers.

This example sets marker number 1, the other two markers (M2 and M3) are set the same way.

Control/Connector	Operation
Power **22**	Press to turn unit on. Line LED is on.
RF On **6**	Press to On (indicator lit) to enable RF signal at RF Output.
RF Level **5**	Set RF level at RF Output connector. Rotate cw to increase output level and ccw to decrease.
RF Output **7**	Signal output from the unit. 50Ω source impedance.
Mode **4**	Select the desired sweep mode. For Start/Stop Sweep, refer to paragraph 3.2.2. For ΔF Sweep, refer to paragraph 3.2.3. For Ext Tune, refer to paragraph 3.2.9.
M1 **3**	Press to select Marker 1. The M1 indicator flashes with a low duty cycle (mostly off).
LCD Display **24**	Shows the frequency of Marker 1.
On/Off **3**	Press once to turn on marker 1. M1 indicator blinks at a high duty cycle (mostly on).
Update **3**	Press once to update marker 1. The Update indicator lights; the M1 indicator remains flashing. Mkr LED **2** is lit which indicates the main tuning knob controls the marker.
Main Tuning Knob **1**	Turn cw or ccw to set marker 1 to desired frequency as shown on the LCD Display **23**.
Mode **4**, Display Start/CF **21**, or Display Stop/ΔF **19**	Press any mode or display button to leave the marker set-up mode. M1 indicator stops flashing and remains lit.
Z-Axis Out **27**	A rectangular pulse to intensity modulate an oscilloscope; see Intensity Modulation in this paragraph and figure 3-4.
Mrk Adj **14**	Adjust for proper intensity on oscilloscope.

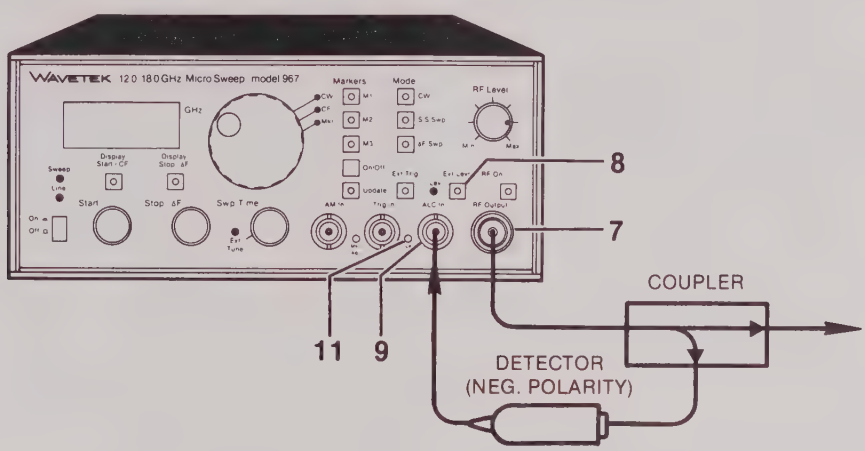


Figure 3-8. External Leveling Operation

3.2.6 ALC/Leveling

Leveling allows the RF output signal to be flat over the entire unit's frequency band. There are two types of leveling in the Micro Sweep: Internal (Option 001 required) and External. Leveling can be used with all modes of operation.

With Option 001 installed, internal leveling is automatic whenever external leveling is not selected and the RF power is on. The Lev indicator is lit. Refer to paragraph 1.2.4 for level limitations.

To use external leveling, setup the Micro Sweep as shown in figure 3-8, then press the Ext Level **8** so its indicator is lit. The Lev indicator **10** will light when a proper leveling signal is present at the ALC In connector. The Lev Adj control **11** sets the leveling loop gain.

3.2.7 Amplitude Modulation (AM)

The output level may be amplitude modulated by using external signal at the AM In. This signal may be either ac or dc. A dc level at the AM In connector may be used to remotely control the output level. The Micro Sweep will respond unidirectionally and logarithmically to the external modulating signal. For example: a 0 to + 10V input (+ 10V is maximum attenuation) will decrease the signal level, while a 0 to -10V input will have no affect. To achieve maximum depth of modulation, set the RF Level to full cw. Figure 3-9 shows the controls and connectors required for Amplitude Modulation. The unit may be amplitude modulated in any mode.

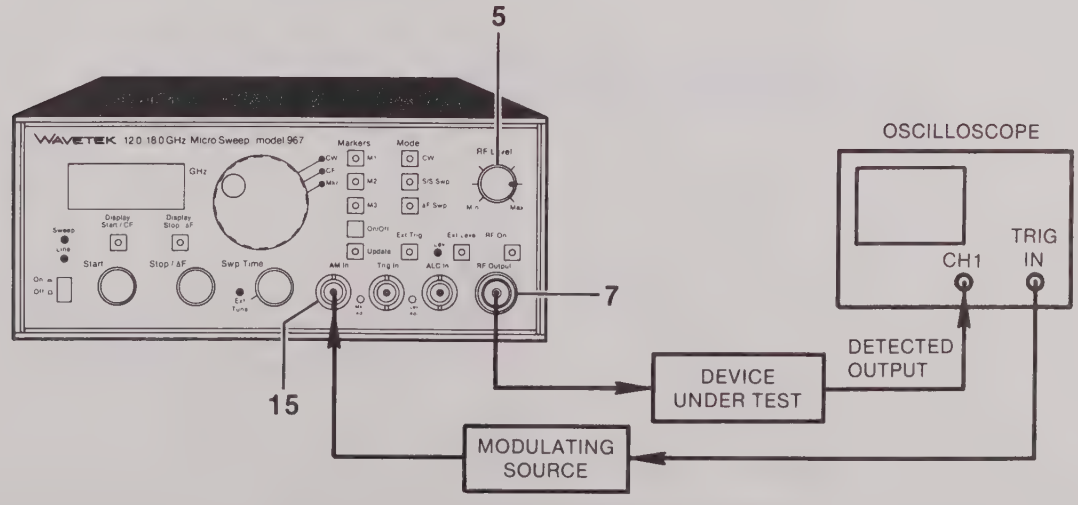


Figure 3-9. Amplitude Modulation Operation

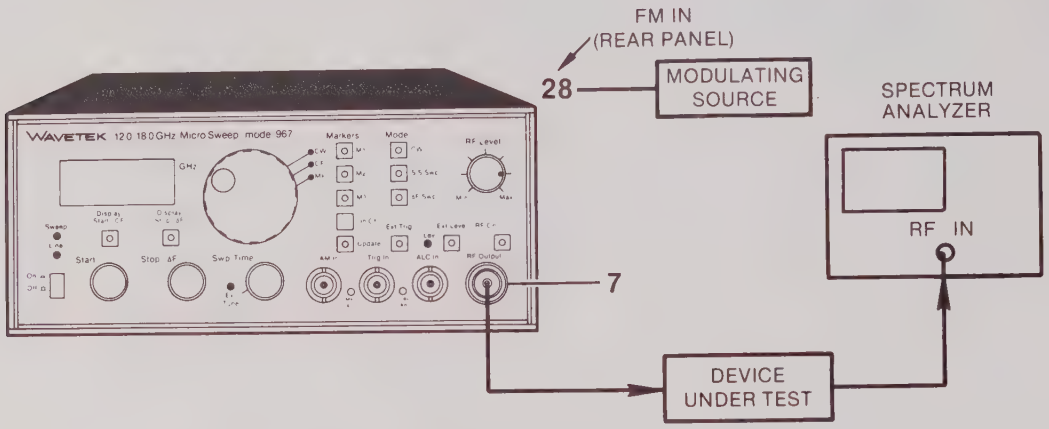


Figure 3-10. Frequency Modulation Operation

3.2.8 Frequency Modulation

The micro source's frequency may be modulated by an ac or dc signal. Figure 3-10 shows the controls and connectors required for frequency modulation. In addition, the FM In can be connected to the phase lock output of a phase locking counter to achieve the frequency accuracy of the counter's internal time base.

3.2.9 External Tuning

When the Swp Time knob is set to Ext Tune (the detent position), an external level controls the frequency of the microwave oscillator. Selecting Ext Tune automatically places the Micro Sweep in the CW mode. A 0V (minimum frequency) to + 10V (maximum frequency) level controls the oscillator. Figure 3-11 shows the controls and connections required for external frequency tuning. An internal tuning filter which filters the YIG tuned oscillator tuning current, can be switched in or out; see paragraph 2.2.6. If the external tuning signal is changing at a fast rate (>1V/second) or it is important to optimize frequency tracking during switching, the filter should be switched out (reduced filtering). When external tuning is used in conjunction with a source locking counter or any application requiring low residual FM, the filter should be switched in (maximum filtering); this is the factory setting.

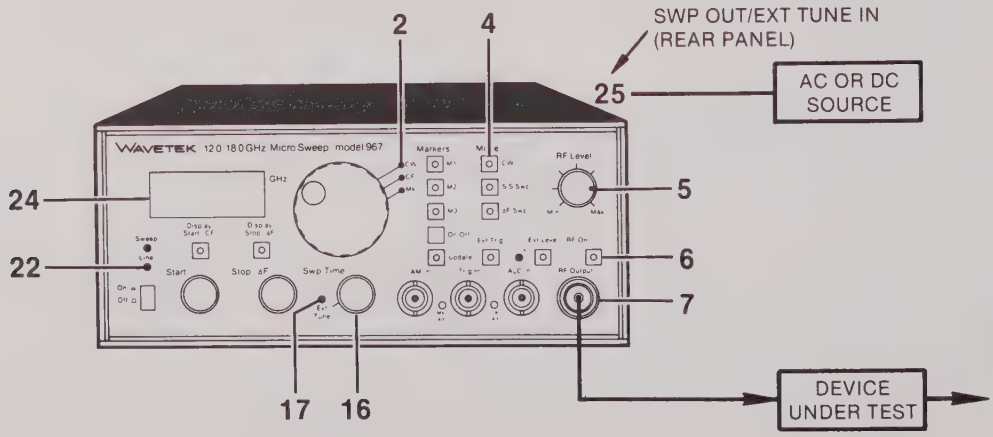
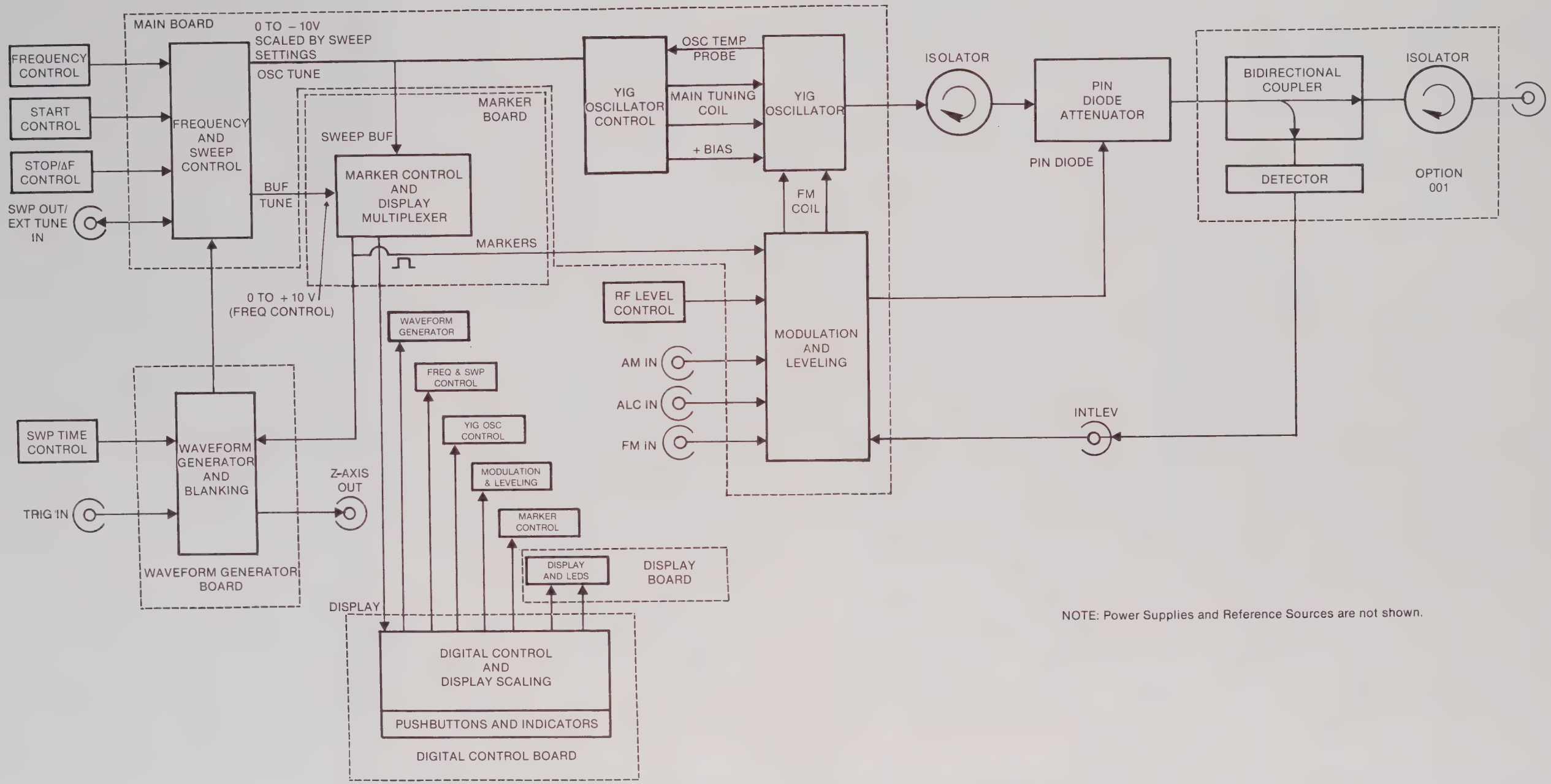


Figure 3-11. External Frequency Tuning Operation



NOTE: Power Supplies and Reference Sources are not shown.

Figure 4-1. 960 Series Overall Block Diagram

SECTION 4
CIRCUIT DESCRIPTION

4.1 GENERAL DESCRIPTION

The Model 960 series consist of four microwave sweep generators that cover the following frequency ranges.

Model 962 1.0—4.0 GHz
Model 964 3.7—8.4 GHz
Model 965 7.0—12.4 GHz
Model 967 12.0- 18.0 GHz

All four Micro Sweep models contain identical circuits; the only difference is the YIG Oscillator and related calibration adjustments. Figure 4-1 shows the major circuits within the Micro Sweep and their relationships. Circuits are divided between five circuit boards: Main Circuit, Marker Circuit, Waveform Generator Circuit, Digital Control Circuit, and Display. Most major circuits are located on their respective board, however some circuits have sections located on several boards.

4.1.1 Power Supplies

A modular power supply attached to the top cover converts the primary ac power into + 16V dc and − 16V dc. These supplies provide the input voltage for the four other supplies: ± 13V and ± 6.3V used within the Micro Sweep.

4.1.2 References

There are three reference sources used in the Micro Sweep: + 10 REF, + 10__BUF, and − 10__REF. The fundamental reference is the + 10 REF; the other references are derived from this reference. These sources provide the accurate, high stability voltages required for various circuits in the instrument. All references are generated by a heater controlled zener diode.

4.1.3 Digital Control

When a front panel pushbutton is pressed, the Digital Control block decodes the transition and enables the appropriate control line or lines. These control lines control the various circuits within the Micro Sweep. The Digital Control block enables all front panel indicators except the frequency display.

4.1.4 Waveform Generator

The Waveform Generator block produces the Micro Sweep's internal modified sawtooth waveform and blanking pulses. To produce the modified sawtooth waveform, a constant current source charges a timing capacitor, a comparator detects the peak and discharges the timing capacitor. Two clippers limit the top and bottom peaks of the waveform. The front panel Sweep Time control varies the charging current supplied by the constant current source. The modified sawtooth waveform also can be externally triggered by enabling and disabling the comparator. Normally, the waveform generator retriggers itself (Auto-trigger). However, an external trigger signal can enable the Waveform Generator to produce one modified sawtooth waveform per trigger signal. The Waveform Generator also produces a blanking pulse which is coincident with the top and bottom flat portions of the modified sawtooth waveform as well as the waveform's retrace. In addition, marker pulses from the Marker Control are combined with a blanking pulse to form the Z-Axis Out blanking pulse and marker signal.

4.1.5 Frequency and Sweep Control

The Frequency and Sweep Control block originates the dc level for setting the CW, CF (center), and marker frequencies. Also, this block scales the modified sawtooth waveform into the scaled sweep waveform for setting Start and Stop, and ΔF (deviation) frequencies. Signal flow within this block depends upon the selected operating mode.

4.1.6 YIG Oscillator Control

The YIG Oscillator Control block contains the circuits that directly control and drive the YIG Oscillator. A main tuning coil driver sums the OSCTUNE input with an input from the temperature control circuit to produce the YIG main tuning coil current. The OSCTUNE input from the Frequency and Sweep Control may be either a dc (CW and Ext Tune) or scaled sweep waveform (Sweep modes). The temperature control circuit monitors the temperature within the YIG oscillator and makes slight frequency corrections by vary current to the YIG main tuning coil.

4.1.7 YIG Oscillator

The YIG Oscillator (a separate module) produces the microwave signal supplied by the instrument. Varying the current, supplied by the YIG Oscillator Control, through the main tuning coil controls the frequency of the oscillator. The FM coil allows the frequency of the oscillator to be frequency modulated (FM) by varying the current through the smaller FM coil within the oscillator. An oscillator temperature probe senses the temperature of the oscillator and provides input for a temperature compensation circuit (in the YIG Oscillator Control) which makes small frequency corrections relative to the temperature. An internal heater maintains the oscillator's YIG circuit temperature at approximately 100°C. The + Bias supplies the voltage (approximately + 13V) required for the transistor within the oscillator.

4.1.8 Marker Control

The Marker Control block stores up to three user set frequencies which can produce marker pulses in either sweep mode or CW. Each marker may be turned on or off as needed. The output pulse (MARKER) is routed to the Modulation and Leveling circuit where it is diverted to either the Attenuation control circuit (RF PIP markers) or the Waveform Generator and Z-Axis blanking for Z-Axis intensity markers.

4.1.9 Modulation and Leveling

The Modulation and Leveling block provides all the output level related controls: RF Level, amplitude modulation (AM), automatic level control (ALC) and, if installed, internal leveling. In unleveled operation, the RF level can be varied over at least a 25dB range. In the leveled operation, the RF level is limited to approximately a 7dB range or greater. The primary output from the Modulation and Leveling block is the PIN diode driving current (PIN-DIODE). Varying the diode current will change the RF output level.

Another output is the FM Coil drive current that drives a smaller FM coil in the oscillator housing, which varies the magnetic field within the oscillator and the output frequency. An external FM signal must be supplied.

4.1.10 Display

The Display block selects, scales, and displays the eight frequencies: Start, Stop, ΔF, Marker 1, Marker 2, Marker 3, Center, or CW. The display multiplexer, located on the Marker board, selects one of the eight inputs to the Display. A resistor network scales the input, and a voltmeter/display converts and displays the frequency.

4.2 DETAILED CIRCUIT DESCRIPTION

4.2.1 Power Supplies

4.2.1.1 ±16V Modular Power Supply

The ±16V Modular Power Supply, a potted, non-repairable unit, is a switching-type power supply which is attached to the top cover. The cover acts as the heat sink for the supply. AC power to the supply is received through a fused connector (Corcom on the rear panel) and a line switch (S1). The switch (S1), which mounts on the rear panel, is operated by a pushrod through the front panel. Balancing resistors (R189, 190, and 191; refer to schematic 0103-00-1848 sheet 5 of 5) maintain reasonable matching of the plus and minus output currents drawn from the supply and provide a minimum load for good regulation. Different models use different balancing resistors; check the parts lists for correct values. The modular power supply provides ±16V for the Oscillator Bias, Tuning Coil Drive, and ±13V regulators.

4.2.1.2 ±13V Regulators

The ±13V regulators are two, three-terminal regulators (VR4 and VR5) located on the rear panel (refer to schematic 0103-00-1848 sheet 2 of 5) which power most circuits within the Micro Sweep. These regulators receive their inputs from the ±16V supplies. Resistors R8 and R9 adjust the regulator VR4 for −13V. The diode CR2 protects VR4 if the −16V input is shorted. Resistors R10 and R11 adjust the regulator VR5 for +13V. The diode CR3 protects VR5 if the +16V input is shorted.

4.2.1.3 ±6.3V Regulators

The ±6.3V regulators are two, three-terminal regulators (VR1 and VR2; refer to schematic 0103-00-1848 sheet 2 of 5) which power various circuits within the Micro Sweep. These regulators receive their inputs from the ±13V supplies. Resistors R14 and R15 adjust the regulator VR2 for −6.3V, and resistors R12 and R13 adjust the regulator VR1 for +6.3V.

4.2.2 References

4.2.2.1 +10V Reference

The +10V Reference (refer to schematic 0103-00-1848 sheet 1 of 5) provides the precision reference voltages required to establish the output frequency, the display scaling, the oscillator temperature compensation, and input for the +10 BUF reference. The temperature controlled precision reference source (U6) provides a super-stable voltage output to the control amplifier (U1 pin 3). The output of control amplifier U1 is fed to the buffer

transistor (Q1). Q1 uses the +13V supply as a source. The emitter of transistor (Q1) can be set to exactly +10V by the +10V REF ADJ potentiometer (R3), which connects to U1 pin 2. This +10V reference is the source for only the most critical circuits requiring a +10V reference. The remaining less critical circuits are supplied by the +10V Buffered supply.

4.2.2.2 +10V Buffered

The +10V buffered supply (refer to schematic 0103-00-1848 sheet 1 of 5) provides +10V to the less critical circuits requiring a +10V supply. Operational amplifier (U2C) and transistor (Q11) form a voltage follower which is referenced to the +10VREF source. The +10V REF voltage is applied to pin 10 of the voltage follower U2C which controls the regulator transistor (Q11). The output of Q11 feeds back to the inverting input (Pin 9) of the voltage follower U2C, this maintains the +10V output within a few millivolts of the +10V reference. Thus, the buffered supply will have little voltage variation due to load current changes.

4.2.2.3 −10V Reference

The −10V Reference (refer to schematic 0103-00-1854) supplies −10V to the VREF input of the marker DACs and the ΔF Offset of the Frequency and Sweep control circuits. This circuit, located on the Marker control circuit board, consists of an unity gain inverting amplifier U30B. The amplifier's gain is fixed by resistors R75 and R74.

4.2.3 Digital Control

The Digital Control (refer to schematic 0103-00-1857 sheet 1 of 2) provides the digital control lines required to control other circuits within the Micro Sweep. When a front panel pushbutton is pressed, the Digital Control decodes the input lines from the pushbuttons and enables the appropriate output line or lines. The Digital Control also lights the related front panel indicators. The Digital Control block consists of the pushbuttons and LEDs, debounce and clock circuit, programmable logic arrays with memory register outputs, and logic array for output decoding.

Within the circuit, the majority of the work is accomplished by three, factory programmed, logic arrays (U1, U2, and U3). Of these logic arrays, U1 and U2 contain output registers. These registers store the current operating state of the Micro Sweep, much the same as a computer memory. In each of these registered arrays, the input contains programmable AND and OR gates which are used to synthesize the desired logic function. The rising edge of the input clock stores the decoded input signals in the array's output registers.

Each of the logic arrays has a unique program and independent function. Array U1 is largely responsible for the "status" of the instrument's operating mode such as CW, Start/Stop sweep, etc. The outputs of this array are typically active low signals that are used to transmit the status to most of the circuits in the instrument. Two lines, MODE 1 and MODE 2, control the operating mode of Micro Sweep by selecting one of the Micro Sweep's four operating states; only three modes are of any operating value, and the fourth is used for test purposes. Table 4-1 describes the control lines.

Table 4-1. MODE Truth Table

State	MODE 1	MODE 2
Display Test	0	0
Start/Stop Sweep	1	0
Delta F Sweep	0	1
CW	1	1

Logic array U2 primarily controls the markers and the display. The principal outputs of this array are the marker on/off signals: M1, M2, and M3. The second major set of outputs is the "Display Mode": DM1, DM2, and DM3. These three lines are used to indicate which of the eight possible frequencies is is being multiplexed to the display. Table 4-2 shows the truth table for the "Displayed Mode" control lines.

Table 4-2. Displayed Mode

Displayed Frequency	DM3	DM2	DM1
Delta Frequency	0	0	0
M1	0	0	1
M2	0	1	0
M3	0	1	1
Stop Frequency	1	0	0
Start Frequency	1	0	1
Center Frequency	1	1	0
CW Frequency	1	1	1

The third Logic Array (U3) decodes and combines the signals produced by the two registered arrays (U1 and U2). For example, it decodes the two mode lines to produce the line $\overline{\text{CWLITE}}$ which goes low when both mode lines are high. It also generates signals to drive many of the indicator LED's

4.2.3.1 Pushbuttons and LEDs

All 13 front panel pushbuttons are located on the Digital Circuit board (refer to schematic 0103-00-1857 sheet 1 of 2). One end of each switch connects through a 1kΩ pull-up resistor (R21) to VCC (+ 6.3V). The other end of the switch connects to an input of one of the two registered programmable arrays U1 or U2. Each input to the programmable array is pulled down to ground through a 10kΩ resistor RN2 and RN3. When a pushbutton is pressed, the input to the PAL goes from a logic 0 to a logic 1 state.

Most LEDs in the Micro Sweep are lit by pulling the cathode low. The exception is the "Lev" indicator (CR21) which is driven from the Modulation and Leveling block. Many of the LED's are integrated inside their respective switches. All switches except for the Marker On/Off toggle switch have internal LED's. The Marker indicator LED's are driven by U3 which combines information from the display mode (DM1 through DM3), marker on/off status (M1 through M3), and the blink signal. Thus, the markers can be either on, off, or blinking with either a high or low duty cycle.

4.2.3.2 Pushbutton Debounce and Clock Timing

The counter (U4; refer to schematic 0103-00-1857 sheet 1 of 2) functions as a debounce circuit for the pushbuttons. Also, the counter U4 provides two sequenced pulses which are used to store the decoded pushbutton input information into the array's output registers. This counter's outputs sequentially pulse high when the circuit is enabled and clocked. The circuit's primary inputs are the 45 kHz clock (U4 pin 14) which is generated by the display voltmeter and the $\overline{\text{ANYIN}}$ signal (U4 pin 15) which immediately goes low when any pushbutton is pressed. Outputs for the counter are the lines STATCLK (U4 pin 10), which latches data into the "status" logic array U1, and MKRCLK (U4 pin 5), which performs the same function for the "marker" logic array U2. Data is latched by the logic arrays U1 and U2 when their respective clocks make a low to high transition.

In the counter's quiescent state, the output (U4 pin 9) is high which feeds back to pin 13, inhibiting the count.

When any pushbutton on the front panel is pressed, $\overline{\text{ANYIN}}$ (U1 pin 12) immediately goes low. This signal connects to U4 pin 15 and resets all counter outputs on U4 to the low state. This allows the counter to begin counting. After four input clock pulses, STATCLK (U4 pin 10) goes high. This delay provides sufficient time for data stabilization and avoids pushbutton bounce. The STATCLK pulse latches the decoded data into U1's output registers. In another two clock pulses, MRKCLK (U4 pin 5) pulses high. This delay allows time for the output data from U1 to stabilize and to accommodate the data set-up requirements in U2. This second clock pulse, MRKCLK, latches data into U2's output register. In another two clock pulses, U4 pin 9 pulses high. This signal inhibits the RES input U4 pin 15 and freezes counting at that point.U4 stays in this condition until another pushbutton in depressed and $\overline{\text{ANYIN}}$ provides another high to low transition.

4.2.3.3 Registered Programmable Logic Array

Status Logic Array

Logic Array U1 primarily decodes and stores the operating status of the instrument. It receives inputs from the CW (pin 2), S/S (pin 3), and ΔF (pin 4), Ext Lev (pin 5), RF On (pin 6), Ext Trig (pin 7), and Update (pin 7) pushbuttons. The array also receives an input from U2 (ANY2) which goes high when any pushbutton attached to U2 is pressed.

The outputs of U1 control the operating mode of the instrument. Table 4-3 lists the functions of the outputs from U1.

Marker Logic Array

The marker logic array (U2) contains logic which controls the display multiplexer and the on/off status of the markers. Inputs to the array consist of marker pushbuttons M1 (pin 2), M2 (pin 3), and M3 (pin 4), and Display Start/CF (pin 7), Display Stop/ΔF (pin 8), and On/Off (pin 9). U2 also receives mode inputs, MODE 1 (pin 6) and MODE 2 (pin 5), from U1 and the ANYMODE signal (U2 pin 12).

The outputs of U2 consist of two, three bit control busses. The first bus is the display mode bus DM1 (pin 16), DM2 (pin 17), and DM3 (pin 18). This bus controls the display multiplexer which selects the analog frequency signal sent to the display; see table 4-2. For example, if all DM lines are a logic high, the CW frequency is routed to the display.

The second U2 control bus M1 (pin 13), M2 (pin 14), and M3 (pin 15) indicates which markers are turned on. These lines are active low if the associated marker has been turned on.

U2 also provides the output ANY2 U2 pin 19 which goes high to indicate that a U2 input pushbutton is pressed.

Table 4-3. Status Array Functions

PIN	Name	Function
18	$\overline{\text{UPDATE}}$	Goes low (active) when Update key is pressed. Returns high as soon as any pushbutton is pressed.
17	$\overline{\text{LEV}}$	Toggles between high and low states when Ext Lev key is pressed. A low state indicates external leveling.
16	$\overline{\text{RF\_\_LITE}}$	Toggles between high and low states when RF On key is pressed. A low state indicates RF is on.
15	EXTTO	Toggles between low and high when Ext Trig key is pressed. A high state indicates external trigger.
14	MODE1	Low order bit of mode command. This line changes relative to operating mode of the instrument. Refer to table 4-1.
13	MODE2	High order bit of mode command. Refer to table 4-1.
19	ANYMODE	Goes high (active) whenever any pushbutton associated with U1 is pressed. It alerts U2 that a pushbutton has been pressed.
12	$\overline{\text{ANYIN}}$	Goes low (active) when any front panel pushbutton is pressed.

4.2.3.4 U3, Output Decoding Logic Array

The output programmable logic array (U3) decodes four sets of inputs from the registered programmable arrays U1 and U2 to produce the following output lines: SWEEP (pin 18) is an active high when the instrument is in either Start/Stop or ΔF sweep modes, $\overline{\text{CW LITE}}$ (pin 17) is an active low when CW mode is selected, STOP DF (pin 16) is an active low when either the stop frequency or ΔF frequency is selected for display, and START CF (pin 15) is an active low when either the Start or Center frequency is selected for display. When the Ext Trig pushbutton is pressed, EXTTO (pin 7) toggles, but in CW mode the output array (U3) inhibits $\overline{\text{EXTT}}$ because external triggering in the CW mode is an illegal operation. In the sweep modes, $\overline{\text{EXTT}}$ (pin 19) is active low when external trigger is active.

U3 also provides outputs on pins 12 through 14 which control the marker status indicator LED's. U3 sums the BLINK signal at pin 1 together with the display mode (whether or not the marker is being displayed) and the marker on/off status to drive LED's CR16 through CR18. If the marker is not being displayed, the output is active low providing the associated marker has been turned on. If the marker is off, the output signal is high. If the marker is being displayed, the output is summed with the BLINK signal to result in a signal which is mostly active low if the marker has been turned on. If the marker is not on, the inverse of the BLINK signal is summed to result in an output which is mostly high.

4.2.3.5 Blink Timer

The blink timer U27 generates the 8 Hz, 30% duty cycle pulse which blinks the Marker (M1, M2, M3) LEDs under certain conditions. The timer allows the capacitor C65 to charge to approximately +4.2V; the current through resistor R192 and CR34 supplies the charging current. At +4.2V the timers DCHG lines goes low and the capacitor discharges through R193. The cycle repeats indefinitely.

4.2.3.6 Miscellaneous Circuits

The display scaling and offset circuit (refer to schematic 0103-00-1857 sheet 2 of 2) is included on the digital circuit board. However, it is not used with the digital circuits. Refer to paragraph 4.2.10.2 for details on this circuit.

4.2.4 Waveform Generator

The Waveform Generator (refer to schematic 0103-00-1875) produces the modified sawtooth waveform, which ultimately varies the YIG oscillator frequency. Also, it generates the blanking pulse for Z-Axis display modulation.

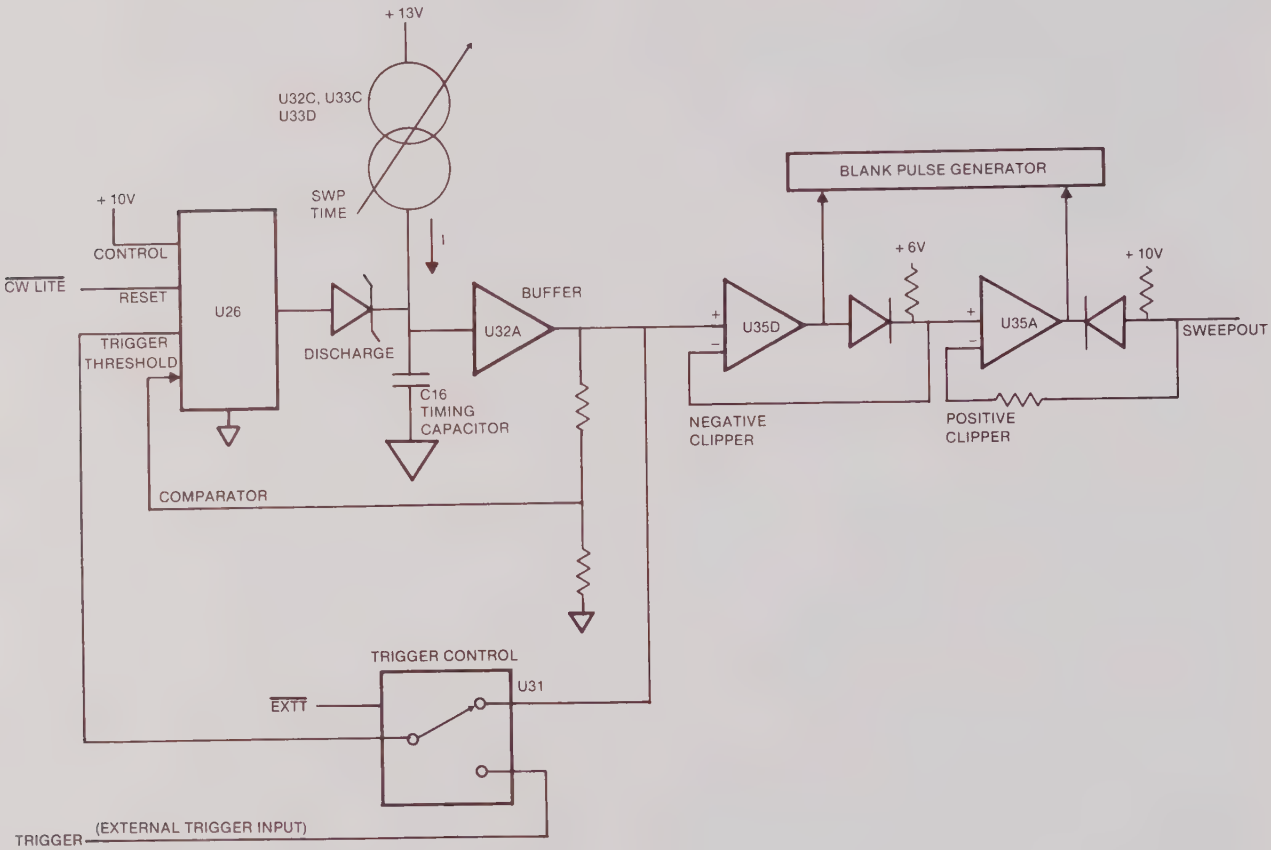


Figure 4-2. Waveform Generator

4.2.4.1 Sweep Waveform Generator

The sweep waveform generator (see figure 4-2 and refer to schematic 0103-00-1875) consists of a constant current source, a comparator, waveform buffer, bottom flat clipper, and top flat clipper. The constant current source U32C, U33C, and U33D, controlled by the Swp Time control R21, provides the precision, high stability current that charges the timing capacitor C16. Charging the capacitor will produce the positive-going ramp. The comparator within the timer U26 detects the ramp's positive peak (about + 10.6V), toggles and discharges the timing capacitor (to about + 3.9V). The sawtooth waveform is buffered by U32A and routed to the sweep shaper. The sweep shaper clips the negative and positive peaks of the sawtooth waveform to produce the modified sawtooth waveform. This modified sawtooth waveform drives the Frequency and Sweep Control block.

Constant Current Source

The constant current source (refer to schematic 0103-00-1875) supplies the charging current for the sweep generator's timing capacitor C16. This charging current can be varied by the front panel Swp Time control (RATE CONTROL on schematic) R21.

The + 10 BUF biases the base of two matched PNP transistors U33C and U33D at + 10V. Also, the voltage divider R20 and the RATE RANGE potentiometer R23 divides the + 10 BUFF to approximately + 0.1V which is the operational amplifiers non-inverting input (U32A pin 10). The feedback loop from U32C through R18 and PNP transistor U33C attempts to control the amplifier's inverting input (U32C pin 9) to equal the reference voltage at pin 10. Therefore, the voltage at pin 9 of U32C equals the reference set by R20 and R23 and is impressed

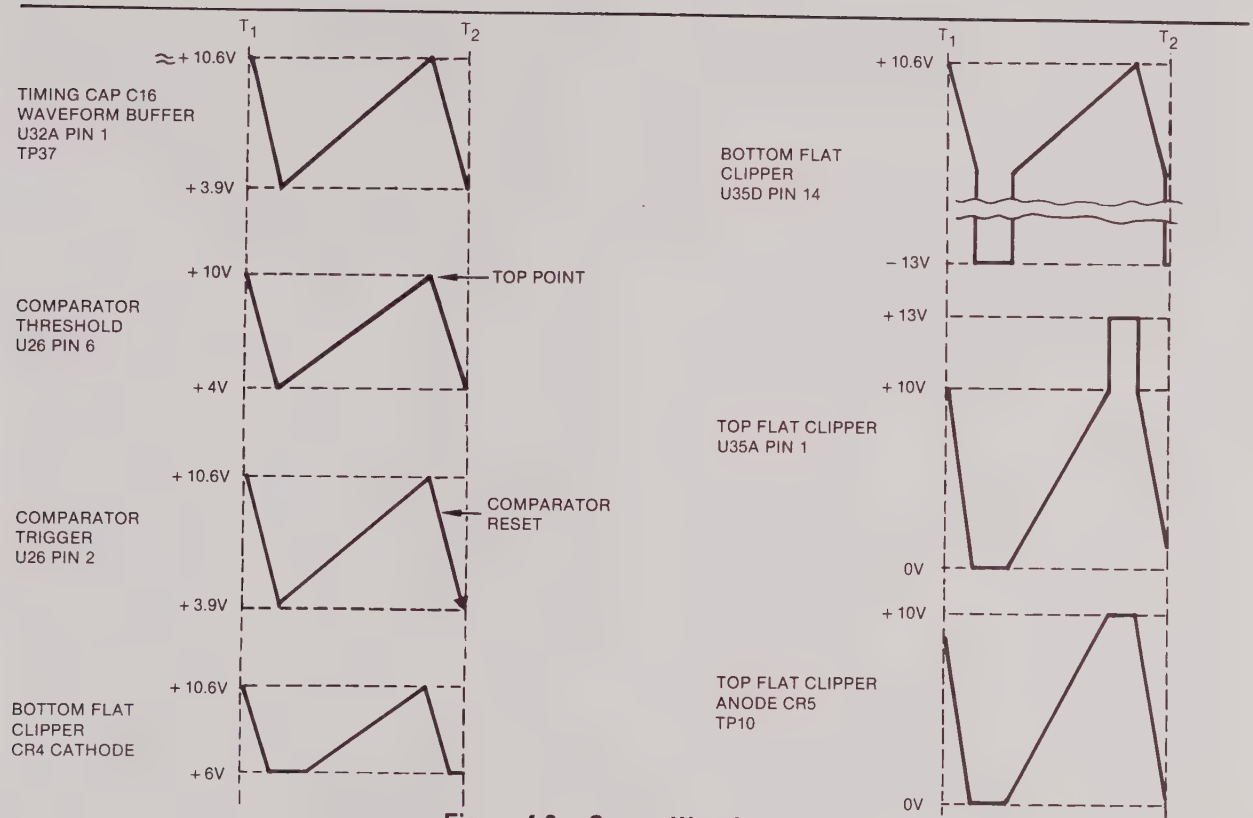


Figure 4-3. Sweep Waveforms
NOTE: Micro Sweep Set to Auto-trigger

across the series resistors R25 and R21 (the front panel Swp Time control). The setting of R21 determines the current which flows through it, given the constant voltage across it. This current is sourced by the collector of U33C.

Both U33D and U33C are matched transistors (they share a common substrate). Their bases are connected to the + 10 V reference voltage, and their emitter circuits contain matched resisters R18 and R26. This arrangement forces the collector currents of U33D and U33C to be identical. Thus, the circuit develops a constant current, controlled by the resistance of R21, that charges the timing capacitor C16. Charging a fixed capacitor with a constant current produces a linearly increasing ramp voltage signal. See figure 4-3: TP 37. This is the source of the sweep waveform used by the Micro Sweep.

Comparator

The comparator, which is internal to the timer U36, (refer to schematic 0103-00-1875) detects the + 10.6V positive peak of the ramp by comparing the sweep signal with a + 10V reference at U26 pin 5. At the peak, it discharges the timing capacitor C16 to + 3.9V. See figure 4-3: TP 37.

As the timing capacitor is charged, the ramp generated is buffered by U32A to minimize capacitor leakage. This buffered ramp from U32A pin 1, GEN__OUT (see figure 4-3: TP37), drives one end of the voltage divider R220 and R221. The divider allows about 98% of the GEN__OUT ramp to drive the threshold THR input of the timer U26 pin 6 (see figure 4-3: Comparator Threshold). Thus, while the timer toggles at + 10V, the actual waveform peaks at about 10.6V.

When the ramp at GEN__OUT reaches + 10.6V (+ 10V at U26 pin 6), the timer switches the discharge line DCHG (U26 pin 7) to ground potential. With U26 pin 7 low, the capacitor begin charging. However, zener diode CR6 limits the discharge to + 3.9V, the negative peak of the ramp. R37 controls the discharge rate. A + 10.0V voltage reference U36 sets the positive trip point (CTRL U26 pin 5) to + 10V.

In auto-trigger, the GEN__OUT ramp is also fed through the Trigger Control switch U31 to the timer's trigger input TRIG U26 pin 2. On the discharge of the GEN__OUT ramp (+ 10.6 to + 3.9V transition), the timer is triggered, which allows the capacitor to recharge (see figure 4-3: Comparator Trigger).

In the External Trigger mode, the trigger control switch (U31) ac couples the timer's TRIG input U26 pin 2 to the Trig In BNC on the front panel. When the external trigger signal goes low, the falling edge initiates one cycle of the sweep sawtooth.

The timer's reset line (RESET: U26A pin 4) connects to the $\overline{\text{CWLITE}}$ control line from the Digital Control block. When either the ΔF sweep or Start/Stop Sweep mode is selected, the $\overline{\text{CW LITE}}$ is high enabling the comparator. But, if CW mode or External Tune is selected, $\overline{\text{CW LITE}}$ goes low which disables the comparator and waveform generator.

Sweep Shaper

The sweep shaper (refer to schematic 0103-00-1875) produces the modified sawtooth waveform by clipping the positive and negative peaks of the waveform generator's sawtooth waveform.

To clip the negative peak, the + 3.9 to + 10.6V (approximate) sawtooth (see figure 4-3: TP 37) from the buffer U32D drives the bottom flat clipper U35D which acts as noninverting, unity gain amplifier while the diode CR4 conducts. Diode CR4 will conduct when the sawtooth waveform is greater than + 6.2V; resistors R27, R28, and R29 bias the cathode of CR4 at approximately + 6.2V. However, below + 6.2V the loop opens up, and U35D pin 14 goes to − 13V and stays there until the level at pin 14 exceeds + 6.2V (see figure 4-3: Bottom Flat Clipper U35D pin 14). The output from the clipper U35D is a + 6V to + 10.6 (approximate) negative peak modified sawtooth waveform (see figure 4-3: Bottom Flat Clipper CR4 Cathode).

To clip the positive peak, the output from the negative peak clipper U35D drives the input to the top flat clipper (U35A) which works similar to bottom flat clipper. The top flat clipper's output TP10 SWEEPOUT is a 0 to + 10V modified sawtooth waveform (see figure 4-3: TP10).

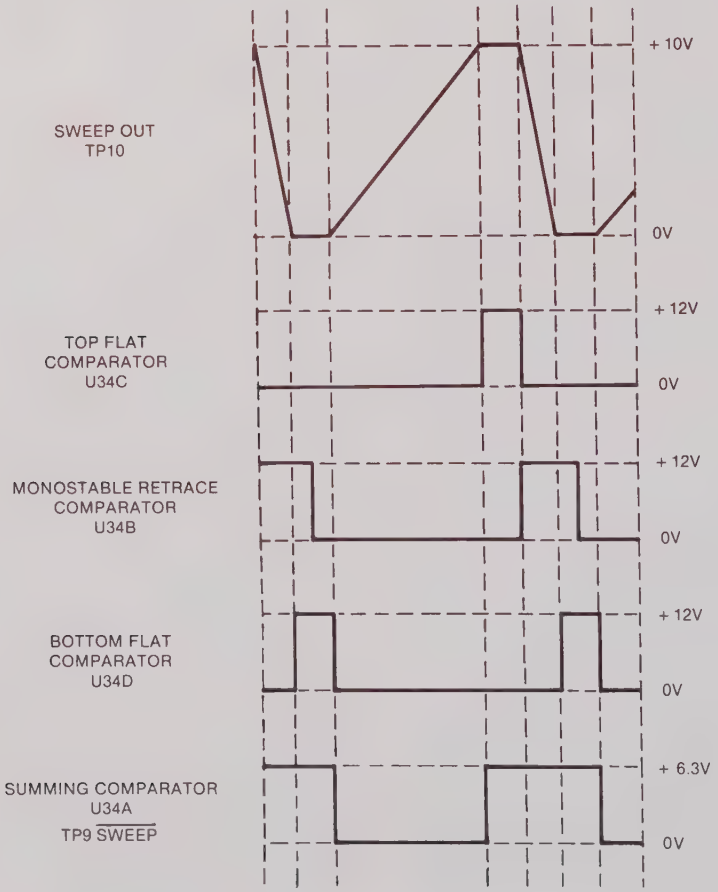


Figure 4-4. Blanking Pulse Waveforms

4.2.4.2 Blanking Pulse Generator

The blanking pulse generator (refer to schematic 0103-00-1875) creates a blanking pulse during the top flat spot, retrace, and bottom flat spot of the modified sawtooth waveform (see figure 4-4: TP 10). This generator consists four comparators. A simplified schematic of this pulse generator is shown in figure 4-5. This circuit also contains the $\overline{\text{SWEEP}}$ buffer, which drives the Sweep indicator LED, and the Z-Axis output drive circuit.

Top Flat Comparator

The top flat comparator U34C produces a +12V pulse during the top flat portion of the modified sawtooth waveform. The comparator's inverting input (U34C pin 10) is biased at +10V by the +10BUFF, and the non-inverting input (U34C pin 11) connects to the top flat comparator (U35A pin 1). Thus, when the output of the top flat clipper (U35A pin 1) exceeds +10V (see figure 4-3: Top Flat Clipper U35A pin 1), the top flat comparator (U34C pin 13) toggles to +12V. When the output of the clipper goes below +10V, the comparator's output returns low. See figure 4-4: Top Flat Comparator.

Bottom Flat Comparator

The bottom flat comparator (U34D) produces a +12V pulse during the bottom flat portion of the modified sweep waveform. The reference for the comparator U34D pin 9 is the $\overline{\text{CWLITE}}$ high during sweep modes (approximately +5V) divided by resistors R93 and R97. The bottom flat comparator (U34D pin 8) toggles high when the output of the bottom flat clipper (U35D pin 14) drops below +3V (see figure 4-4: Bottom Flat Comparator). When the output of the clipper goes above +3V, the comparator's output returns low. The resistor divider R95 and R96 and the diode CR12 limits the comparator input to +0.6V to keep U34D pin 8 from going negative.

Monostable Retrace Comparator

The comparator U34B, configured as a monostable, generates a blanking pulse during the sweep waveform retrace. The falling edge of the top flat comparator (see figure 4-4: Top Flat Comparator) triggers the multivibrator. The output (U34B pin 2) toggles high and about 10ms later resets low; the resistor R102 and capacitor C39 controls the time constant (see figure 4-4: Monostable Retrace Comparator).

Summing Comparator

Comparator U34A acts as an "OR" gate and sums all three blanking pulses to produce a single +12V blanking pulse that remains high during the top flat spot, retrace, and bottom flat spot of the modified sawtooth waveform (see figure 4-4: TP9). As long as one of the three comparator output pulses remain high, the summing comparator's output remains at +6.3V.

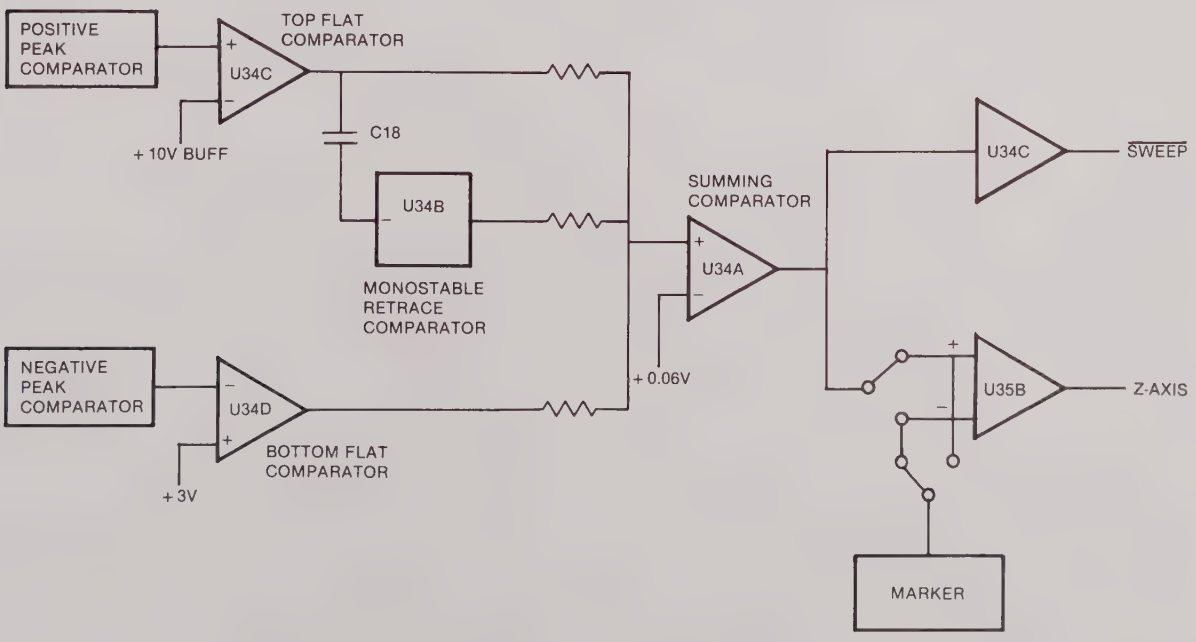


Figure 4-5. Blanking Pulse Generator

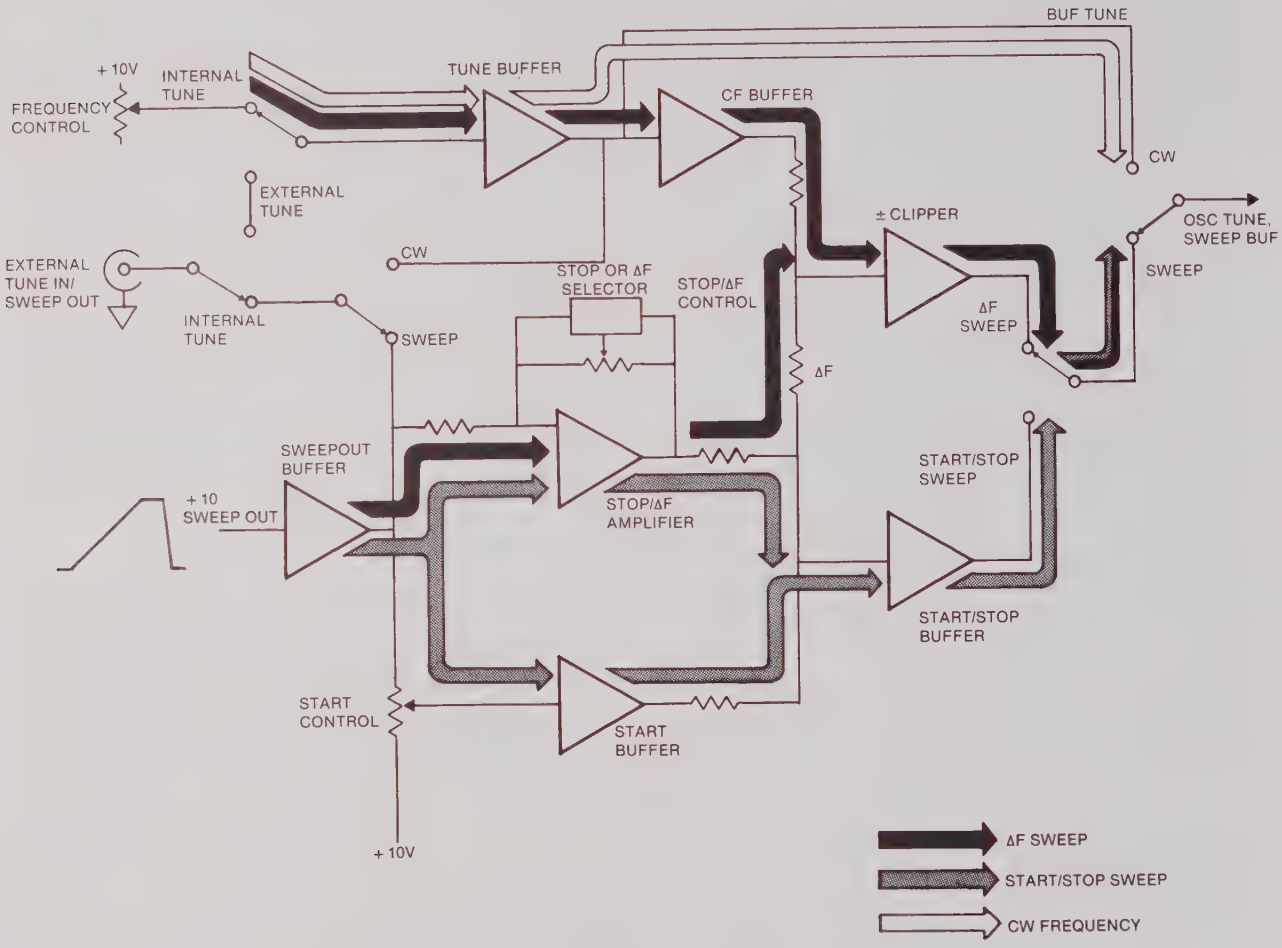


Figure 4-6. Frequency and Sweep Control

$\overline{\text{SWEEP}}$ Buffer

The $\overline{\text{SWEEP}}$ buffer U35C, a noninverting unity gain buffer, (refer to schematic 0103-00-1875) drives the front panel Sweep indicator LED. When the $\overline{\text{SWEEP}}$ line is low (the ramp portion of the waveform), the Sweep indicator LED will light providing a sweep mode is selected (see figure 4-4: TP 10 and TP 9).

Z-Axis Switching and Buffer

This circuit (refer to schematic 0103-00-1875) selects the polarity of the blanking pulses and the marker pulses. The switch S1 selects the pulse polarity by switching the pulses to either the inverting (U35B pin 6) or the non-inverting input (U35B pin 5) of the output amplifier U35B. For more details on selecting pulse polarity refer to paragraph 2.2.4.

4.2.5 Frequency and Sweep Control

The frequency generated by the Micro Sweep is controlled by either a dc tuning signal or a sweep waveform. The Frequency and Sweep Control block sets the dc voltage (0 to + 10V) required to set the CW, external tune, and Center Frequencies. Also, this block processes the modified sawtooth waveform from the Waveform Generator to create the scaled sweep waveform for the ΔF and Start/Stop sweep modes. In addition, the Frequency and Sweep Control block supplies the dc level used to set the markers. Figure 4-6 shows the frequency and sweep control block along with its signal flow for the various operating modes.

In internal tune CW mode (shown as a white line in figure 4-6), front panel frequency control regulates the voltage (BUF TUNE) that tunes the YIG oscillator. In external tune

(shown as a white line in figure 4-6), the YIG oscillator is tuned by a dc or low frequency voltage at the Sweep Out/Ext Tune In. For Start/Stop Sweep (shown as a grey line in figure 4-6), the Start control and buffer along with the Stop/ΔF gain amplifier condition the modified sweep waveform which tunes the YIG oscillator. If ΔF Sweep mode is selected (shown as a black line in figure 4-6), the Stop/ΔF gain amplifier and CF buffer produce an offset modified sweep waveform which the ± clippers condition to tune the YIG oscillator.

4.2.5.1 Frequency Control and Buffer

The front panel main tuning frequency control (refer to schematic 0103-00-1848 sheet 3 of 5) produces the dc voltage (0 and + 10V) BUF TUNE (shown as a white line in figure 4-6). When internal tune is selected, the tune buffer (U10), a voltage follower, provides isolation between the main tuning potentiometer and following circuits. In internal tune, the output from the voltage follower (U10) is fed via the switch (U11) to the Ext Tune/Sweep Out connector (J6) as an output signal. In external tune, the Sweep Out/Ext Tune In (J6) drives the voltage follower's input (U10 pin 2). U10's outputs (BUF TUNE and OSCTUNE) can tune the YIG oscillator, set the center frequency (ΔF sweep mode), or set any of the three markers.

4.2.5.2 Start/Stop Sweep

The start/stop sweep circuit (refer to schematic 0103-00-1848 sheet 3 of 5 and figure 4-7), also shown as a grey line in figure 4-6, produces a scaled sweep waveform that allows the unit to sweep from a start frequency to a stop frequency. It will allow the oscillator to sweep from either a lower to a higher frequency or from a higher to a lower frequency. This block consists of the start control and buffer, and Stop/ΔF control and amplifier. Both circuits vary the peak to peak level of the modified sweep waveform. The resulting waveforms are mixed at the start/stop sweep summing amplifier (U4B).

Start Control

The sweep start circuit R195B and U4A (refer to to 0103-00-1848 sheet 3 of 5) varies the peak to peak level of the modified sweep waveform in the start/stop mode. The buffered SWEEPOUT waveform from U2A pin 1 (the 0 to + 10V modified sawtooth waveform; see figure 4-8: Sweepout) connects to one end of the START control R195B, the other end of R195B connects to + 10V (+ 10 BUFF). The START potentiometer varies the input level to the unity gain voltage follower U4A pin 3 between 0 and + 10V offset by + 10V dc (see figure 4-8: Start Buffer). The voltage follower U4A provides isolation between the START potentiometer and following circuits.

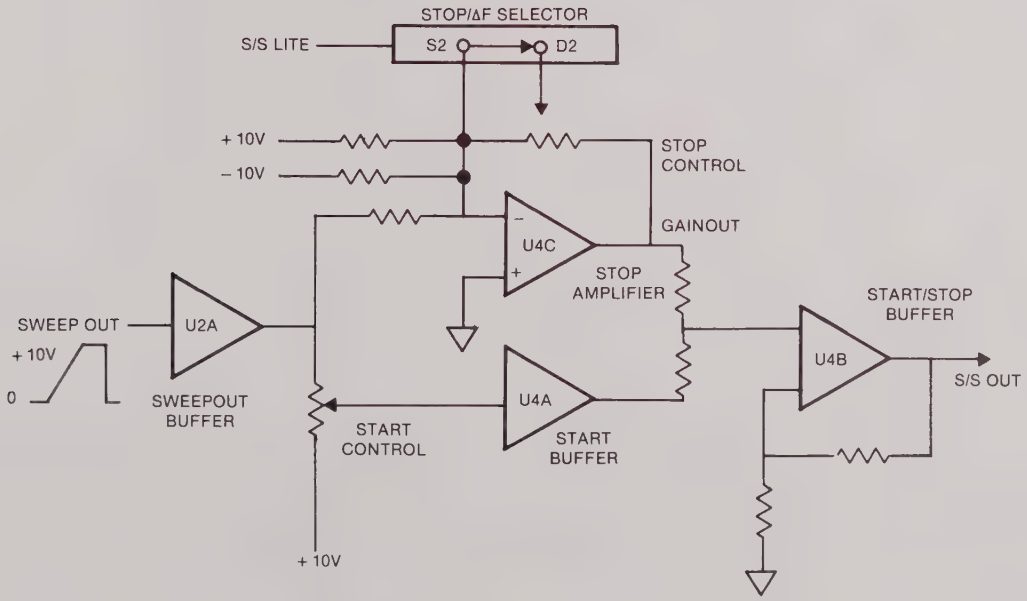


Figure 4-7. Start/Stop Sweep

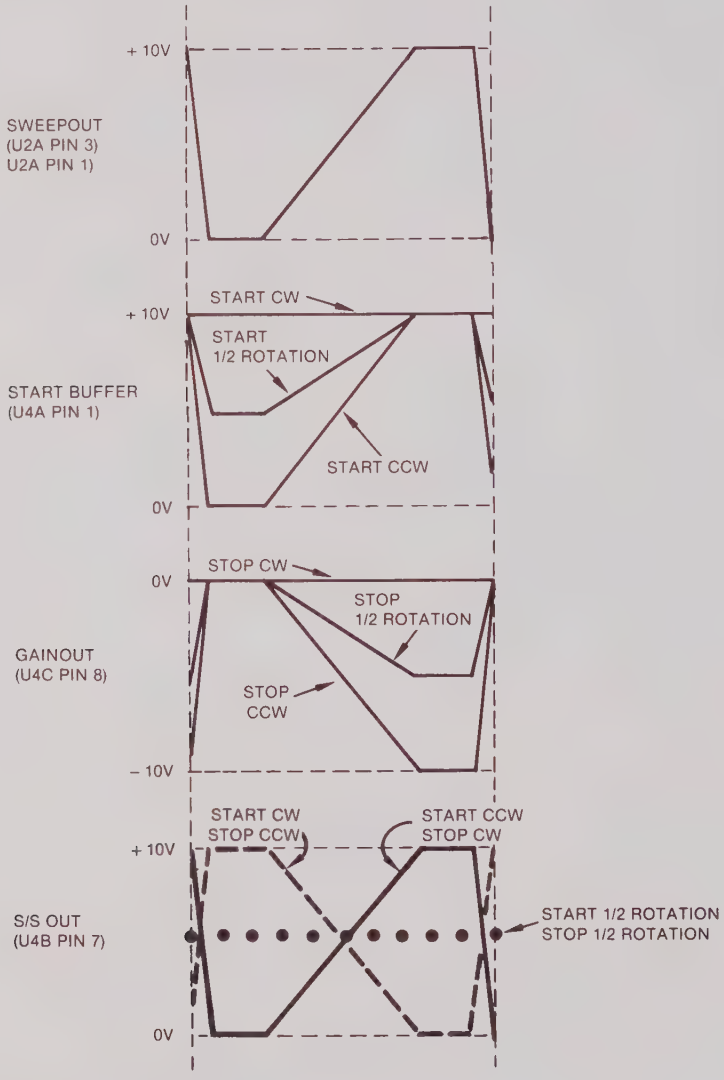


Figure 4-8. Start/Stop Sweep Waveforms

With the START potentiometer R195B full ccw, the full 0 to + 10V modified sawtooth waveform drives the voltage follower (U4A). At full cw setting of the control, the buffer output is + 10V dc. And, at the center of the Start controls rotation, the output is a + 5 to + 10V scaled sweep waveform.

Stop Control

The stop circuit (see figure 4-7) R196B, U4C, and U9A varies the peak to peak level of the modified sawtooth waveform between 0 and -10V by using the STOP/ΔF control R196B to vary the gain of operational amplifier U4C between 0 and – 1. Figure 4-8 shows the output of U4C GAINOUT as the STOP control R196B is rotated from cw (0V) to ccw (full 0 to – 10V modified sawtooth waveform). The offset created by the DELTA-F OFFSET (R203, R58) is cancelled by the OFFSET CANCEL (R201, R57).

The feedback path of the amplifier U4C is controlled by the switch U9A; table 4-4 shows the control lines for the switch U9A in the Start/Stop mode.

Table 4-4. S/S Logic

Control Line	Logic Level	Action	Function
S/S LITE	Low	U9A S2-D2 Closed	Connects wiper R196B to U4C pin 9 (input).
DF LITE	High	U9A S1-D1 Open	Disconnects wiper R196B from U4C pin 8 (output).

Sweep/Stop Buffer

The Start/Stop Sweep Buffer U4B, a non-inverting amplifier with a gain of +2, sums the buffered start signal with the GAINOUT signal to produce the S/S OUT signal. The X2 gain of the amplifier U4B cancels the voltage dividing effect of the input resistors R49 and R50; the resulting maximum output waveform is 0 to +10V . Figure 4-8: S/S Out shows the output at various Start and Stop/ΔF control combinations.

4.2.5.3 ΔF Sweep

The ΔF sweep circuit (refer to schematic 0103-00-1848 sheet 3 of 5 and figure 4-9) produces an offset scaled sweep waveform that allows the unit to sweep upward around the center frequency. In this mode, the center frequency can be set by the main tuning knob anywhere within the range of the Micro Sweep. The Stop/ΔF control sets the frequency deviation. Clipper circuits keep the Micro Sweep from exceeding the limits of its frequency range. This block consists of the Stop/ΔF control R196B and amplifier U4C, the center frequency buffer U3A, and the ± clippers U3C and U3B.

ΔF Control and Amplifier

In the ΔF Sweep mode, the Stop/ΔF control R196B and amplifier U4C produces an output level that can be varied between 0V dc (ΔF full ccw) and ±5V scaled sweep waveform (ΔF full cw) (as shown in figure 4-10: GAINOUT). The Stop/ΔF circuit receives its input from the buffered SWEEPOUT U2A pin 1 (the 0 to +10V modified sawtooth waveform; see figure 4-10: SWEEPOUT). The Stop/ΔF amplifier U4C sums the SWEEPOUT waveform with an offset current (−10V connected to potentiometer R203 and resistor R58) which is effectively divided by two to form a −5V offset to the 0 to +10V sweep signal. The STOP/ΔF potentiometer R196B sets the gain of the amplifier U4C

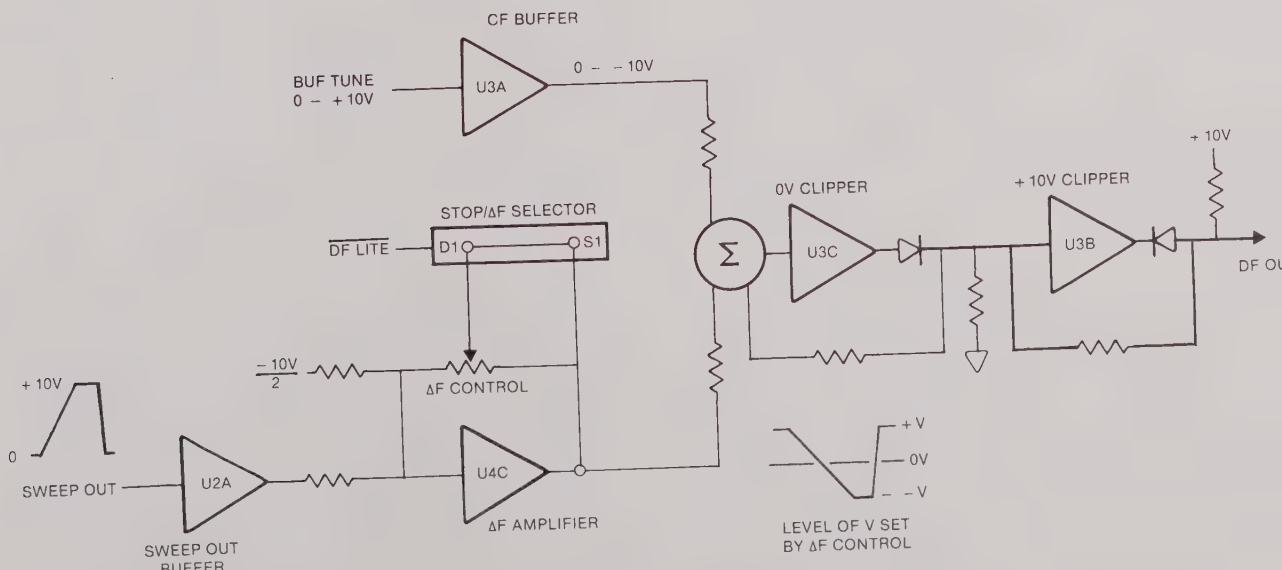


Figure 4-9. ΔF Sweep

Table 4-5. ΔF Logic

Control Line	Logic Level	Action	Function
S/S LITE	High	U9A S2-D2 Opened	Disconnects the wiper R196B from U4C pin 9 (input).
DF LITE	Low	U9A S1-D1 Closed	Connects wiper R196B to U4C pin 8 (output).

between 0 and −1. When the Stop/ΔF control is full ccw, the amplifier output U4C pin 8 is OV (as shown in figure 4-10: GAINOUT). If the Stop/ΔF control is set to full cw, the amplifier output U4C pin 8 is a ±5V scaled sweep waveform (as shown in figure 4-10: GAINOUT).

The switch U9A controls the configuration of the Stop/ΔF circuit; the lines $\overline{\text{DF LITE}}$ and $\overline{\text{S/S LITE}}$ from the Digital Control block control switch U9A (see table 4-5). The +10V BUFF connected to resistors R201 and R57 attaches to the amplifier's output (U4C pin 8) where it has not effect on the circuit.

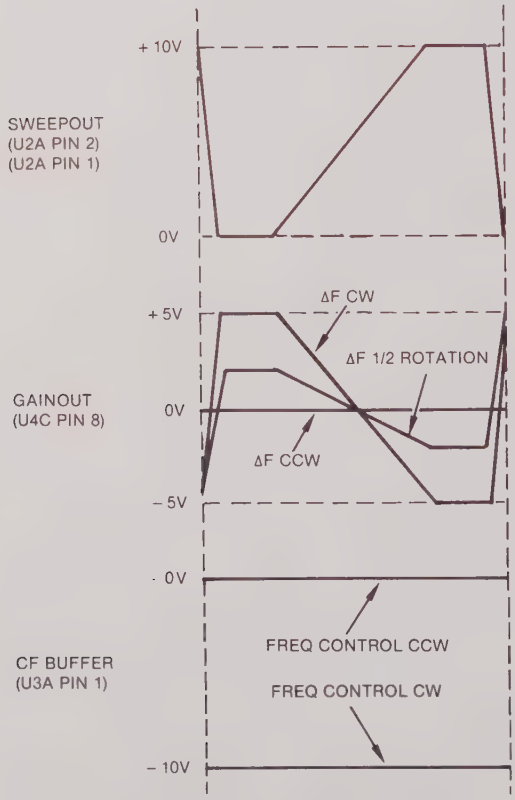


Figure 4-10. ΔF Sweep Waveforms

CF Buffer

The Center Frequency (CF) buffer U3A (refer to schematic 0103-00-1848 sheet 3 of 5 and figure 4-9), a ground referenced, inverting, unity gain amplifier, inverts the 0 (main tuning knob full ccw) to +10V (main tuning knob full cw) BUFTUNE voltage producing a 0 to −10V voltage (as shown in figure 4-10: CF BUFFER). This voltage is summed with the Stop/ΔF amplifier output U4C pin 8 at the OV Clipper amplifier U3C.

ΔF Clipper

The ΔF clipper U3C and U3B (refer to schematic 0103-00-1848 sheet 3 of 5 and figure 4-9) serves two functions. It sums the center frequency voltage and the ΔF scaled sweep waveform. And, it limits the overall peaks to between 0V and +10V, which keeps the Micro Sweep from sweeping beyond the frequency range of the instrument.

The first amplifier U3C is the summing amplifier and 0V clipper. There are two inputs to this amplifier at pin 9: the center frequency voltage summed through a 20 kΩ input resistor (R52) and the ΔF waveform summed through a 20 kΩ input resistor (R51). The two 20 kΩ input resistors and the 10 kΩ feedback resistor R55 set the closed loop gain of the amplifier U3C at −1/2. The loop is closed as long as U3C's output U3C pin 8 is greater than +0.6V. Above +0.6V the diode CR8 conducts (cathode is biased to ground through the 1kΩ resistor). But below +0.6V the diode is reversed bias, the feedback loop opens up, and the output from U3C goes to approximately −13V. The output at the cathode of CR8 is always greater than +0.0V.

The second amplifier U3B is the +10V clipper. The two 100 kΩ divider resistors (R62 and R63) set the amplifier's gain at +2, this gives the clipper circuits an overall net gain of 1. The loop is closed as long as U3B's output (pin 7) is less than +9.6V. Above +9.6V CR9 is reversed bias (anode is biased through a 1kΩ resistor to +10V) opening the amplifier feedback loop which causes the amplifier's output (pin 7) to go to approximately +13V. The output at the anode of CR8 is always less than +10V. Figure 4-11 shows the DF OUT output TP15 for various combinations of the main tuning knob (center frequency) and the Stop/ΔF control in the ΔF Sweep mode.

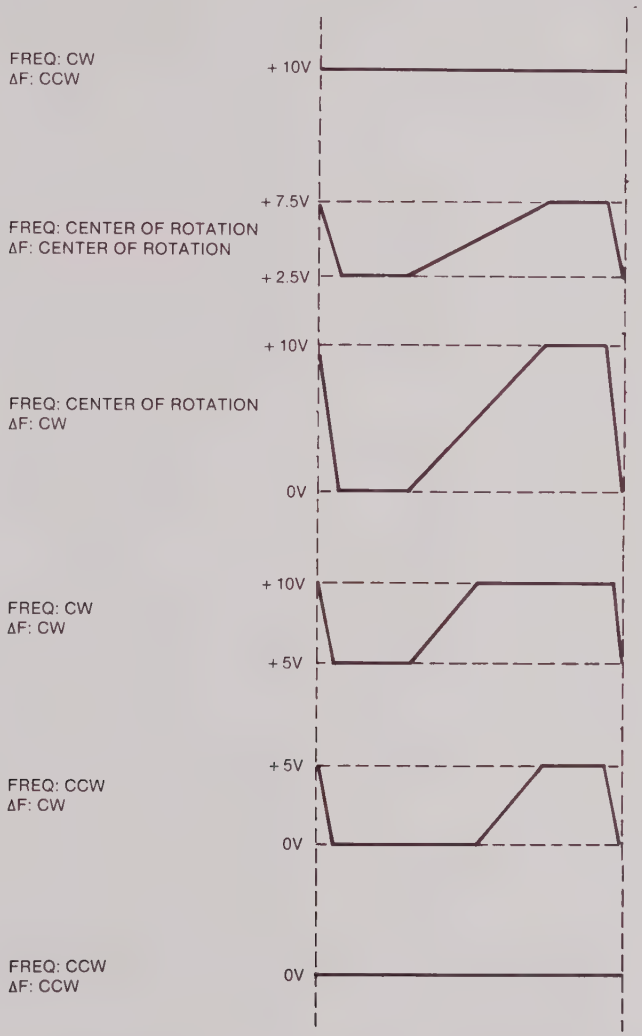


Figure 4-11. DF Out (U9B Pin 11) Waveforms

4.2.5.4 Sweep Switching and Buffer

The switch U9B (refer to schematic 0103-00-1848 sheet 3 of 5) selects either DFOUT (ΔF waveform) or S/SOUT (Start/Stop waveform). When $\overline{\text{DFLITE}}$ goes low, switch U9B S1-D1 closes and routes the DFOUT signal to the sweep buffer (U2D). When $\overline{\text{S/S\_\_LITE}}$ goes low, switch U9B S2-D2 closes which routes the S/SOUT to the sweep buffer U2D input. These two control lines originate in the Digital Control block. The Digital Control logic allows only one switch closed at a time.

The voltage follower (U2D) buffers the selected sweep waveform and routes the sweep waveform to the CW/SWEEP relay K2A.

4.2.5.5 Start and Stop/ΔF Controls (To Displays)

The Start and Stop/ΔF controls R195A and R196A (refer to schematic 0103-00-1848 sheet 3 of 5) are mechanically linked to their respective counterparts R195B and R196B. These potentiometers supply a voltage (0 to + 10V) proportional to the setting of the potentiometers R195B and R196B which are the gain controls for the Start control and buffer U4A and the Stop/ΔF amplifier U4C. The STARTFRQ voltage is a direct input for the display multiplexer. The STOP voltage is buffered by the voltage follower U2B before being routed to the display multiplexer.

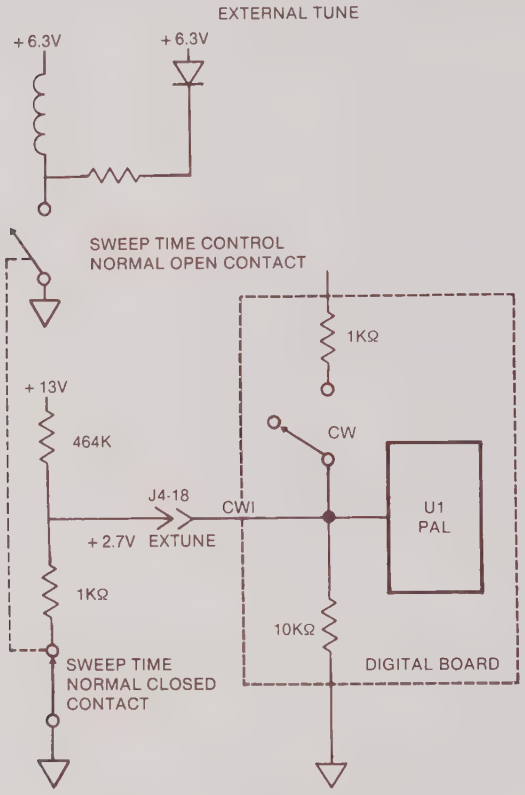


Figure 4-12. External Tune

4.2.5.9 External Tune Switches

The external tune switches (R21-S-NO and R21-S-NC; refer to schematic 0103-00-1848 sheet 3 of 5 and figure 4-12) select the External Tune mode when the Swp Time control R21 is placed in the extreme ccw position (detent).

Switch R21-S-NO is the normally open contact. When external tune is selected, this switch will close, relay K1 will energize, and the LED CR17 will light. Also, the contacts R21-S-NC will open which sends EXTUNE high. This forces logic array U1, located on the Digital Circuit board (refer to schematic 0103-00-1857 sheet 1 of 2), into the CW mode (CWI goes high).

4.2.6 YIG Oscillator Control

The YIG oscillator control block (refer to schematic 0103-00-1848 sheet 5 of 5) supplies the Transistor Bias Supply voltage and Main Tuning Coil drive current to the YIG Oscillator. In addition, it contains the temperature compensation circuit which monitors the temperature of the YIG oscillator and makes slight corrections to the frequency.

4.2.6.1 Transistor Bias Supply

The oscillator bias supply (refer to schematic 0103-00-1848 sheet 5 of 5), a three-terminal regulator VR3, supplies the + 13V required to bias the transistor in the YIG tuned oscillator. The regulator receives its input VR3 pin 3 from the + 16V modular power supply. The voltage divider R185, R186, and R187 sets the regulator's output voltage. The BIAS ADJ R187 allows fine adjustment of the bias supply.

The bias supply is turned off by interrupting the regulator feedback path by switching the relay K3A between the regulator output (VR3 pin 2) and the regulator adjustment divider string R185. Shunting off the bias supply turns off the YIG oscillator (RF Off).

4.2.6.2 YIG Main Tuning Coil

The YIG Main Tuning Coil driver (refer to schematic 0103-00-1848 sheet 5 of 5) provides the current which controls the magnetic field within the YIG oscillator. The Main Coil is the primary frequency control device within the oscillator. The YIG tuning coil driver consists of a summing amplifier U24, referenced to ground (the non-inverting input to the amplifier), and two transistors Q6 and Q9 (a Darlington amplifier) which drive the main tuning coil. The amplifier U24 sums signals from the Temperature Compensation circuit (refer to paragraph 4.2.6.7), the tune offset bias (R168 and R164), and the OSCTUNE signal. The amplifier U24 drives the JFET current source Q7 which controls the output transistors Q6 and Q9. Zener diode CR27 maintains the output voltage of the summing amplifier within an effective range. The tuning coil draws its current from the − 16V supply, through the transistor Q9 and the YIG main tuning coil, to the sense resistor (R153) and, finally, to ground. The negative voltage developed across the sense resistor R153 feeds back to the summing input of the amplifier U24. The feedback resistor R181 along with the two input resistors R177 and R178 scale the current for the different frequency bands. Resistors R164 and R168 set the tuning offset.

In the CW mode, the filter tune relay (K2B) places a capacitor (C61) in parallel with the tuning coil. This capacitor improves residual FM performance. Whenever sweep modes are used, the capacitor C61 is removed to provide quick tuning response. The resistor R182 reduces the Q of the inductive/capacitive combination by providing the dissipative element. Switch SW2-4 allows the filter to be disconnected even in the CW mode and external tune modes.

4.2.6.3 Temperature Compensation

The temperature compensation circuit monitors the temperature of the YIG oscillator housing and produces

a signal which is summed into the YIG Main Tuning Coil circuit to make small changes in frequency to compensate for temperature. The temperature compensation circuit consist of an oscillator temperature probe, a two terminal integrated circuit transducer which attaches to the bottom of the YIG oscillator housing, and two sense amplifiers U22A and U22B. The temperature probe monitors the case temperature of the oscillator. This probe senses the temperature and conducts a current proportional to the temperature of the oscillator. The amplifiers U22A and U22B sense the current and convert it into a voltage proportional to the temperature of the oscillator. TUNE TC ADJ potentiometer R165 connected between TP30 and TP31 picks off the temperature sensitive voltage and applies it to the summing junction TP28. This temperature compensation current is summed with the TUNE OFFSET ADJUST level and the OSCTUNE at the input of the YIG Main Tuning Coil amplifier (U24).

4.2.6.4 Circuits Shown But Not Used

On the YIG Oscillator Control Circuit schematic (0103-00-1848 sheet 5 of 5), there are circuits shown, but not used in the Model 960 series Micro Sweeps. These circuits (Gunn Bias Drive, Gunn Diode Osc., Isolated Bias Supply Transistor Osc., and Supply Rectifiers Isolated Bias Supply) are used with other types of YIG oscillators. They are not currently being used in the 960 series.

4.2.7 YIG Oscillator

The heart of the Micro Sweep generators is the solid state, Yttrium-Iron-Garnet (YIG) tuned oscillator. A high-Q YIG sphere forms the passive frequency resonant element. Frequency is controlled by varying the magnetic field within the oscillator which tunes the YIG resonant frequency. The Magnetic field is controlled by varying the current through the YIG Main Tuning coil. The smaller FM coil allows the frequency to be modulated at higher rate than would be possible using the main tuning coil.

The YIG oscillator requires three inputs for operation: bias voltage, tuning current, and heater voltage. The micro sweeps use a dedicated +13V oscillator bias supply to bias the oscillator's internal transistor. The tuning current drives the YIG main tuning coil which controls the magnetic field and oscillator frequency. The heater voltage, approximately 26V, drives the self-regulating heater maintaining the YIG sphere at a constant 100°C temperature. This elevated temperature of the YIG sphere minimizes external influences. The oscillator temperature probe monitors the oscillator's case temperature and provides an input element for the temperature compensation circuit.

In the Model 962, the PIN diode attenuator is part of the YIG oscillator. In the Models 964, 965, and 967, the PIN diode attenuator is external to the YIG oscillator. However, the PIN diodes are all controlled by the PIN Diode Driver (refer to paragraph 4.2.9.2). The attenuator is a dual diode reflective type attenuator which is adjustable over a 0 to 25 dB range. The PIN diodes (refer to schematic 0103-00-1848 sheet 4 of 5) shunt a 50Ω strip transmission line; as the diode current increases shunt resistance decreases, reducing the power level at the attenuator output.

4.2.8 Marker Control

The marker control (refer to schematic 0103-00-1854) stores up to three marker frequencies and produces a pulse as the sweep frequency, SWEEPBUF, sweeps past the the marker frequency. The marker frequency is stored by first converting an analog voltage proportional to the marker frequency into a 10-bit digital word. Then, this 10-bit word is stored in one of three latching DAC's. The DAC reconverts the digital word back into an analog voltage which drives the positive input of a comparator. As the modified sawtooth waveform (connected to the comparator's negative input) passes the marker voltage the comparator switches from high to low. The transition is differentiated and converted into a pulse by an output comparator.

4.2.8.1 Marker Analog To Digital Converter

The Marker Analog to Digital (A to D) converter U12 (refer to schematic 0103-00-1854) transforms an analog voltage (0 to +10V), proportional to the marker frequency as set by the main tuning knob, into a 10 bit digital word. The analog voltage (BUF_TUNE), scaled by resistors R69 and R70, drives the A to D convertor's VIN+ input U12 pin 6. This input voltage VIN+ to the A to D is 50% (0 to +5V) of the BUF TUNE voltage. The MARKER ZERO POINT ADJUST potentiometer R216 offsets the A to D the VIN− input (U12 pin 7). The reference to the A to D (U12 pin 9) is +2.5V (derived from the +10V Buff supply) which can be adjusted by potentiometer R76. This effectively sets the gain of the A to D.

To initiate the conversion process, the circuit U15E and U15D provide a pulse to force an initial conversion in the A to D converter. When the $\overline{\text{MKRSET}}$ control line goes low which is generated by the front panel Update pushbutton, the high to low transition of $\overline{\text{MKRSET}}$ is differentiated by capacitor C29 and routed through the two inverters (U15D and U15E) to the $\overline{\text{WR}}$ and $\overline{\text{INTR}}$ inputs of the A to D forcing an initial conversion. As long as the $\overline{\text{MKRSET}}$ remains low, the A to D continually converts the analog signal to a 10-bit digital word. This allows the marker frequency to be continuously changed.

While the $\overline{\text{MKRSET}}$ line U12 pin 1 is low, the A to D converter will continuously convert the marker control voltage BUFFTUNE into 10 bit digital words. If any pushbutton is pressed, $\overline{\text{MRKSET}}$ returns high and the last conversion is memorized.

The A to D also supplies the A to D clock (ADCLOCK) U12 pin 23 to the D to A converters. The resistor R68 and capacitor C28 set the time constant for the clock. There is no timing relationship between A to D and the D to A converters.

4.2.8.2 Marker Digital To Analog Converter

The Marker Digital to Analog Converters U14, U16, and U17 (refer to schematic 0103-00-1854) change the 10 bit digital word back into a 0 to +10V analog voltage. The converter consists of two parts: the D to A which converts the digitized word into a current and an operational amplifier which transforms the current into a voltage. There are three D to A converters and amplifiers, one for each marker.

Using Marker 3's D to A converter U14 as an example, the converter must first be selected by setting the control line $\overline{\text{M3D}}$ (U14 pins 1 and 4) low. Pushing the Update pushbutton causes $\overline{\text{MKRSET}}$ (U14 pin 2) to go low which loads the 10 bit digital word generated by the A to D converter (U12) into the converter. The ADCLOCK from the A to D converter (U12) clocks the two input registers within the A to D converter. When $\overline{\text{MKRSET}}$ returns high, the data is permanently latched in the D to A. The reference for the D to A is supplied by the −10V REF. The other two D to A converters operate the same as the converter U14.

The D to A converter produces a differential output current at U14 pins 11 and 12. These currents drive the operation amplifier U30A which produces a voltage proportional to the amplifier's input current. Thus, the D to A reproduces the voltage digitized by the A to D.

The marker enable decoder (U28) selects the D to A converter to be updated; see table 4-2. The three inputs (DM1, DM2, DM3) to the decoder, which originate in the Digital Control block, select which of the three output lines ($\overline{\text{M3D}}$: pin 12, $\overline{\text{M2D}}$: pin 13, $\overline{\text{M1D}}$: pin 14) will be enabled (only three of the eight lines are used). The decoder is permanently enabled by hardwiring E1 (pin 4) and E2 (pin 5) to ground, and E3 U28 pin 6 to +6.3V.

4.2.8.3 Marker Output Comparator

The marker output comparator (refer to schematic 0103-00-1854) produces the high to low transition that is converted into marker pulse. Each of the three markers has its own output comparator. Only the comparator for marker 3 will be described, the other two operate the same. The non-inverting input to the comparator (U30A pin 1) is the output voltage from the A to D circuit. The inverting input of the comparator U29C pin 10 connects to the SWEEPBUF input (J15 pin 1). The SWEEPBUF voltage can be either the 0 to 10V scaled sweep waveform (set by the frequency control block) or the dc tuning voltage.

When the SWEEPBUF voltage is lower than the marker voltage, the comparator's output is high. As the SWEEPBUF voltage passes the marker voltage, the comparator's output (U29C pin 13) switches low. The comparator resets at the sweep retrace.

The output of the comparator is enabled or disabled by pulling the comparator output high or low respectively (the comparator has an open collector output). Each output comparator has an inverter connected to its output. When a marker (M1, M2, and M3) is turned on, the line $\overline{\text{M1}}$, $\overline{\text{M2}}$, and $\overline{\text{M3}}$ goes low and the inverter's output (U15B, U15A, and U15F) goes high, enabling the comparators. The comparators are disabled (pulled low) when a marker is not turned on ($\overline{\text{M1}}$, $\overline{\text{M2}}$, and $\overline{\text{M3}}$ remains high).

4.2.8.4 Transition Detector

The output comparator's high to low transition is capacitively coupled to the marker duration comparator (U29B; refer to schematic 0103-00-1854). The + input to the comparator (U29B pin 7) is biased between +4 and +5.7V; this voltage is set by the MARKER DURATION control (R213). As the differentiated marker pulse (U29B pin 6) passes through the level set by the marker duration bias voltage, the marker duration comparator produces a positive pulse at U29B pin 1. Varying the bias voltage moves the comparator's trip point up or down on the differentiated input marker pulse, thus varying the MARKER pulse width.

4.2.8.5 Display Multiplexer

The display multiplexer (refer to schematic 0103-00-1854) is shown on this schematic because many of the inputs and control line are also associated with the Marker Control block. For details about the display multiplexer, refer to paragraph 4.2.10.1.

4.2.9 Modulation And Leveling

The Micro Sweeps use a PIN diode attenuator to vary the RF output level. The circuits in the modulation and leveling block control the PIN diode's current, and consequently, the RF output level. There are several ways of varying the output level: the front panel RF Level control, the front panel AM In, ALC In (external leveling), or optional internal leveling. Figure 4-13 shows the relationship of the circuits within the Modulation and Leveling block.

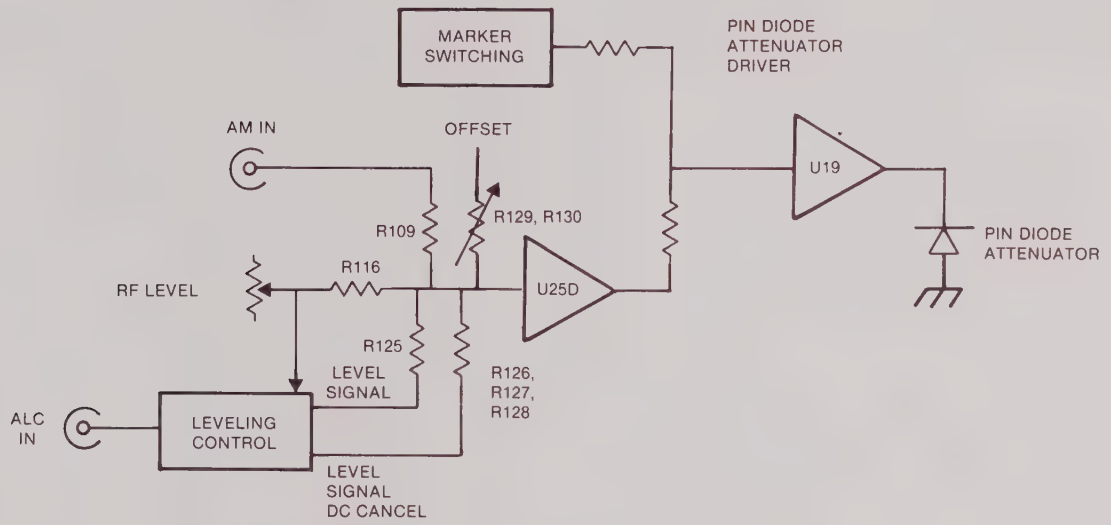


Figure 4-13. Modulation and Leveling

4.2.9.1 Level Input Amplifier

The level input amplifier U25D (refer to schematic 0103-00-1848 sheet 4 of 5) sums the inputs from the RF Level control, AM Input, and an offset bias (R129 and R130). When the micro sweep is being leveled, additional signals are supplied by the automatic leveling control circuit. The resistor network (R114, R1, R115, and R116) supplies a 0 to + 4Vdc signal as the wiper of the front panel RF Level control R1 is rotated clockwise. This network gives the potentiometer a taper which allows a fairly linear control of attenuation (in dB) over the single turn of the RF Level control. This RF Level voltage is scaled by the level input amplifier U25D to a nominal − 1.8V to 0Vdc signal at TP23 (ATTEN DRV).

The external AM input (AM In) can be summed with the RF Level voltage at the summing junction (pin 13) of the summing amplifier U25D. An input of 0 to − 10V peak will be sufficient level to fully amplitude modulate the RF output. Amplitude modulation follows a logarithmic relationship to the drive voltage over the 0 to − 10V range. Positive AM inputs are shunted to ground via the diode CR19 and have minimal effects on the RF output level.

Another inverter (U25A) can be added to invert the attenuation level when cathode grounded PIN diodes are used. This inverter can be selected by removing jumper W5 and installing jumper W6.

4.2.9.2 PIN Diode Attenuator Driver

The PIN diode attenuator driver U19 (refer to schematic 0103-00-1848 sheet 4 of 5) converts the ATN__DRV signal into the PIN diode drive current. Also, intensity markers can be summed with the driver input for RF PIP modulation. Switches SW2-2 and SW2-3 select the PIP markers, and the front panel access potentiometer (R224) sets the marker size. The driver delivers a nominal 6mA drive currrent per input volt to the PIN diode. The maximum current required for maximum attenuation is approximately 20mA (40mA for the Model 962).

4.2.9.3 Automatic Level Control

Automatic level control (ALC) maintains a flat output level over the Micro Sweep's frequency band. The circuit is the control portion of an automatic leveling loop (refer to schematic 0103-00-1848 sheet 4 of 5 and figure 4-14). To complete the loop, either an external negative detector must be used (refer to paragraph 3.2.6) or the internal leveling option (Option 001) must be installed. With either external or internal leveling, the RF level control range is limited to approximately 7dB. The ALC circuit consists of the input switching U20, leveling amplifier U18, leveling comparator U25B, and leveling amplitude control circuit U5 and Q3.

The input switching U20 selects either the external ALC In or internal leveling (Option 001). When the Ext Lev

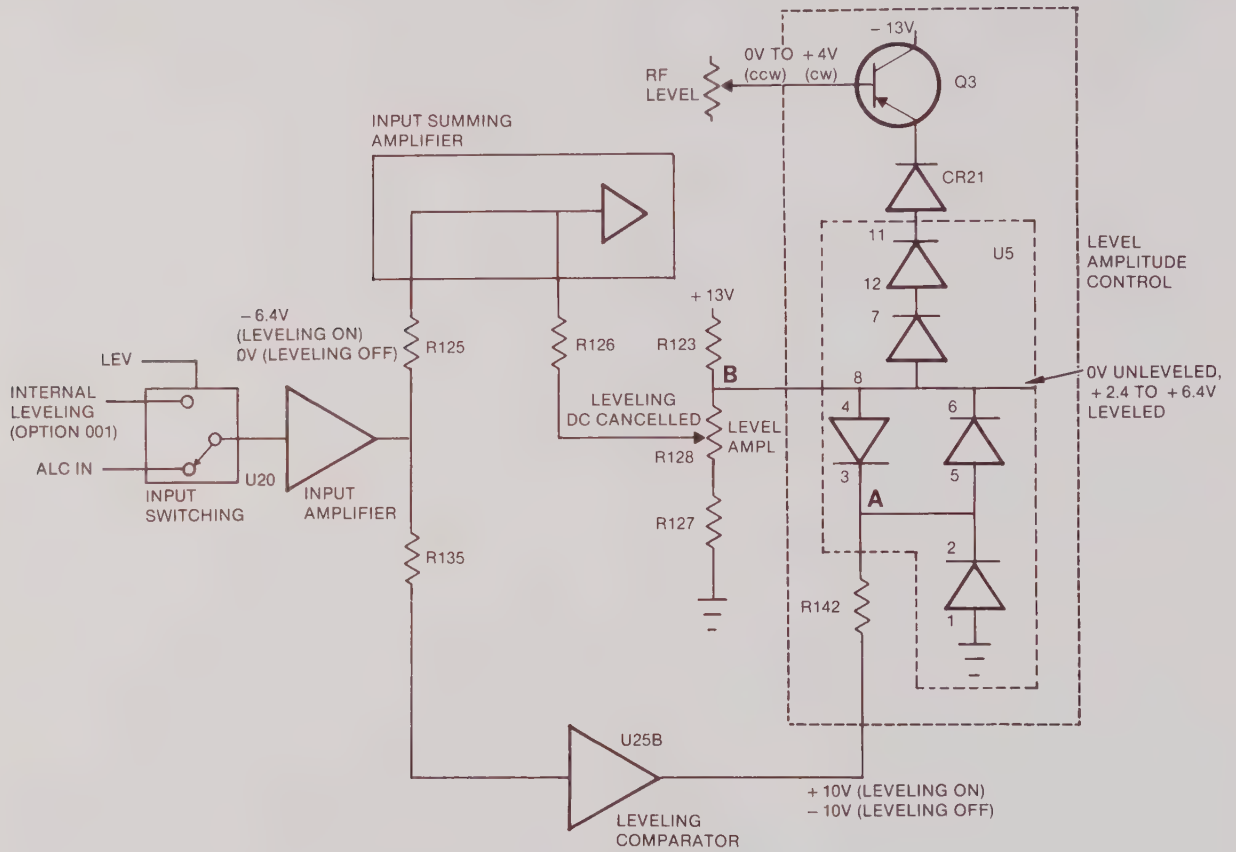


Figure 4-14. Automatic Leveling Control

pushbutton is pressed, the LEV line goes low, closing S2-D2 (opening S1-D1) and connecting the ALC In to the leveling amplifier (U18). The internal leveler (option 001) supplies the input to the amplifier when LEV is high (S1-D1 closed, S2-D2 opened).

The input amplifier (U18) provides both the gain necessary to drive the comparator U25B and an input to the level input amplifier U25D. Without a leveling input signal, the amplifier output U18 pin 6 sets at 0V; the LEVL ZERO potentiometer (R124) adjust the level to 0.0V. With a leveling input signal, the amplifier output sets at about – 6.4V. The gain of the amplifier can be varied by adjusting the front panel LEVELING LOOP GAIN potentiometer control (R131). Setting the amplifier gain affects the amplifier's output voltage.

The leveling comparator (U25B) detects when adequate leveling signal is supplied by the leveling amplifier (U18). Without an ALC input, the comparator output (U25B pin 7) is – 10V. And with an adequate ALC input level, the comparator output (U25D pin 7) is + 10V. The comparator has a reference level set at – 32mV (resistors R139 and R136) and employs positive feedback (resistors R140, R139, and R136) giving ± 3mV hysteresis.

The Leveling amplitude controlcircuit (see figure 4-14) controls the leveling input bias to the level input amplifier (U25D). When unleveled, the comparator U25B biases the input to the diode string at – 10V, which causes the diode (U5 1-2) to conduct. This places point A (figure 4-14)at – 0.6V, clamps point B (figure 4-14) at 0V, and reverse biases diode (U5 7-8). The level dc offset is 0V, "cancelling" the level output of 0V, and the RF level potentiometer has full control of the RF output level.

When leveling is selected and adequate ALC input is received, the comparator U25B switches to + 10V. This forward biases Diode U5 7-8. The transistor Q3 and diode string CR21 U5 pins 11, 12, 7, 8, 6, and 5 conduct, and the diode U5 pins 1 and 2 is revered biased. The level

at point B, determined by the setting of the RF Level control R1, can be varied between + 2.4V (RF Level: full ccw) and + 6.4V (RF Level: full cw). This signal offsets the dc signal in the leveling input and sets the RF Level potentiometer to operate over a more limited range required by the dynamics of the leveling feedback loop.

4.2.9.4 FM Coil Drive

The FM coil driver U21 (refer to schematic 0103-00-1848 sheet 4 of 5) converts the external FM In signal into the FM coil drive current. The FM coil is a small secondary coil within the YIG oscillator which is designed for more rapid tuning than the YIG main tuning coil. Varying the current through the FM coil slightly alters the magnetic field within the YIG oscillator, thus varying the frequency of the oscillator. The driver U21 is configured as a dc coupled, inverting, unity gain power amplifier, with the FM coil and the resistor R150 comprising the feedback path.

4.2.10 Digital Display

The display block (see figure 4-15) selects, scales, and displays the eight frequencies: Start, Stop, ΔF, Marker 1, Marker 2, Marker 3, Center, or CW. One of the eight inputs to the analog multiplexer (located on the Marker board; refer to schematic 0103-00-1854) is selected and routed to the offset and gain network (refer to schematic 0103-00-1857 sheet 2 of 2). The offset and gain network scales the dc voltage for the voltmeter IC (refer to schematic 0103-00-1857 sheet 1 of 2). The voltmeter IC directly drives the frequency display.

4.2.10.1 Display Analog Multiplexer

The display multiplexer U13, located on the Marker board (refer to schematic 0103-00-1854), selects one of eight analog voltages (0 to + 10V proportional to the respective frequency) to be displayed: the ΔF frequency, the three marker frequencies, the Stop frequency, the Start frequency, the Center Frequency, and the CW frequency.

Each of the multiplexer's inputs (U13 pins 4, 5, 6, 7, 9, 10, 11, 12) connects its respective analog frequency voltage directly to its respective source with the exception of the ΔF voltage which must be offset for the display. The three DM control lines (DM1: U13 pin 1, DM2: U13 pin 16, and DM3: U13 pin 15) from the Digital Control circuit are decoded by the multiplexer (refer to table 4-6) and selects the analog voltage (DISPLAY) routed to the Offset and Gain Network.

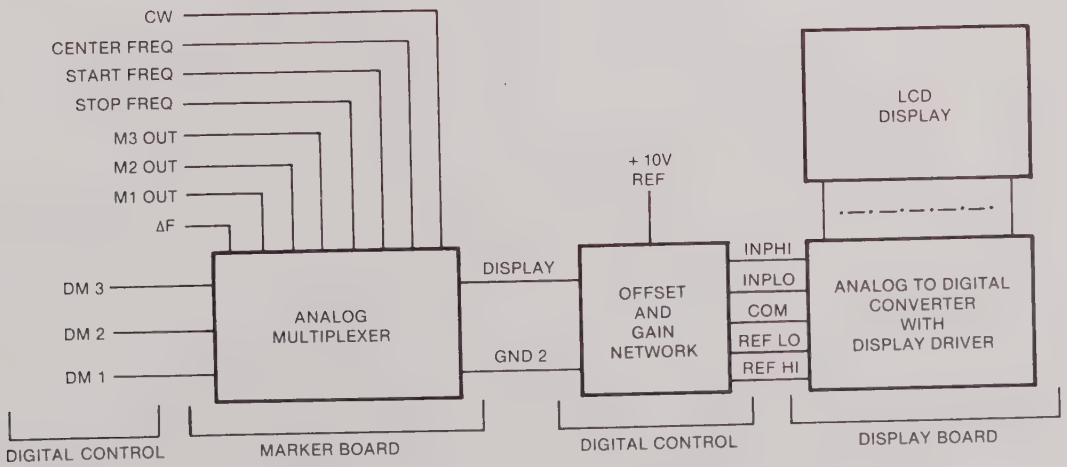


Figure 4-15. Display

Table 4-6. Display Multiplexer Truth Table

Displayed Frequency	Location	DM3 A2 U13-15	DM2 A1 U13-16	DM1 A0 U13-1
ΔF	S1 U13-4	0	0	0
M1	S2 U13-5	0	0	1
M2	S3 U13-6	0	1	0
M3	S4 U13-7	0	1	1
STOP	S5 U13-12	1	0	0
START	S6 U13-11	1	0	1
CENTER (CF)	S7 U13-10	1	1	0
CW	S8 U13-9	1	1	1

4.2.10.2 Offset and Gain Network

The offset and gain network (refer to schematic 0103-00-1857 sheet 2 of 2) scales and offsets the input voltage DISPLAY from the display analog multiplexer U13 (refer to schematic 0103-00-1854) for the digital display voltmeter U5 (refer to schematic 0103-00-1851). The resistors (R9, R10, R11, R12, R13, R15, R17, R14, and R16) comprise this circuit. Potentiometer R13 sets the high end of the Micro Sweep's frequency band and potentiometer R14 sets the low end of the Micro Sweep's frequency band. The + 10V Reference provides a stable reference level for this network.

4.2.10.3 Voltmeter and Display

The voltmeter (U5) converts an analog voltage proportional to the selected frequency and enables the appropriate segments on the 3 digit LCD display U6 (refer to schematic 0103-00-1851).

The voltmeter (U5) is a analog to digital converter (A to D) with a built in LCD display driver which functions as a voltmeter. The voltmeter is powered by ± 6V supplies; these supplies originate with the ± 13V supplies and use the drop of the two zener diodes (CR1 and CR2). The resistor (R7) and capacitor (C3) set the voltmeter's oscillator at 45 kHz; the 45 kHz is also used as the clock for the Digital Control block (refer to paragraph 4.2.7.2). The two capacitors (C4 and C5) and the resistor (R8) are the integrator for the voltmeter. The transistor (Q1), an inverter, drives the decimal point out of phase with the back plane; thus, the decimal point is always displayed. The 24 lines from the voltmeter directly drive the segments of the LCD display.

SECTION 5
CALIBRATION

5.1 FACTORY REPAIR

Wavetek maintains a Customer Service department for those customers not possessing the necessary personnel or test equipment to maintain their instrument. If an instrument is returned to Wavetek for service, a detailed description of any malfunction should be attached to minimize turn-around time.

5.2 EQUIPMENT REQUIREMENTS

Calibration test equipment, minimum specifications and suggested models are given in table 5-1.

NOTE

Minimum specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using laboratory. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

Table 5-1. Calibration Test Equipment

Instrument	Minimum Specifications	Suggested Manufacturer/Model
Oscilloscope	Sensitivity: 5mV/div. Rise/Fall time: <0.05 μs. Sweep rate: 50 ms to 5μs/div. Trigger: Int and Line. Other: XY inputs.	Tektronix 2465 Tektronix 453 Tektronix 475
Spectrum Analyzer	Range: 1 to 18 GHz Freq/Division: 10 kHz/div Bandwidth: 3kHz	Tektronix 492 HP 8559 HP 141T
Frequency Counter	Range: 5Hz to 10 kHz and 1 to 18 GHz. Phase Locking.	EIP 578
RF Power Meter	Response: 1 to 18 GHz Range: +20 to −40 dBm Readout: dBm and dBref.	HP 436A with HP 8484A Power Sensor. Wavetek Microwave 8501.
Digital Voltmeter	Range: 19 mV to 19V full scale. Resolution: 4½ digits Accuracy: ½ LSB.	Fluke 8600A Fluke 8050A
DC Voltage Source	0.0 to +15V dc.	Fluke 332B Datel Model DCV-8500

Table 5-1. Calibration Test Equipment (Continued)

Instrument	Minimum Specifications	Suggested Manufacturer/Model
Directional Coupler	Range: 1 to 18 GHz Coupling: −16 dB	Krytar 1820 Narda 3292-1
Crystal Detector	Polarity: Negative Range: 1 to 18 GHz. Sensitivity: >400 μV/μW	HP 8470B Option 012.
RF Attenuators	3dB with Type N connectors, 1 to 18 GHz. 10 dB with Type N connectors, 1 to 18 GHz. 40 dB with Type N connectors, 1 to 18 GHz.	HP 8491B Option 003. HP 8491B Option 010. HP 8491B Option 040.
Coaxial Adapters	BNC Tee	Pomona Model 3285, Tektronix 103-0030-00
Coaxial Cables	50Ω BNC(M) to BNC(M). 50Ω BNC(M) to Type N (M).	
Scope Probe	Direct Probe (X1).	Tektronix P6028, Tektronix P6101.
Network Scalar Analyzer		Wavetek Models 1038-N10 or 1038-NS20

5.3 PRELIMINARY SETUP PROCEDURES

WARNING

Calibration sequences require power On with the instrument covers removed. This should be done only by qualified personnel aware of the electrical hazards.

1. Verify that all power switches are off, and set all calibration test equipment controls as necessary to avoid damage to the equipment and that dangerous voltages will not be present on output terminals when the power switches are turned on.

2. Remove the Micro Sweep instrument top cover while being careful not to damage the modular power supply wiring on the top cover. The top cover with the modular power supply will have to be supported in order to relieve tension on the interconnecting cables.

3. Set SW2 on the main board as follows:

   1 Closed
   2 Open
   3 Closed
   4 Closed
   5 Closed

   Set SW1 on the Waveform Generator board as follows:

   1 Closed
   2 Closed
   3 Open
   4 Open
   5 Closed

4. Connect the calibration test equipment and the Micro Sweep to the appropriate power source.

5. Do not change the setting of any Micro Sweep control or switch unless specifically instructed to do so. Each following step depends on the setting from the preceding step.

6. Turn the Micro Sweep and all calibration test equipment power switches on, and allow sufficient warm-up time for the equipment (the Micro Sweep requires 15 minutes warm-up time).
7. All of the test points (TP) and adjustments used in the Micro Sweep calibration procedure are located on the main, Marker, and Waveform Generator boards are shown in figure s 5-1, 5-2, and 5-3.

NOTE

Due to the interaction between adjustments, calibration of the instrument should be performed in the exact sequence presented in the calibration procedure.

5.4 CALIBRATION

Table 5-2 contains the calibration procedures that cover routine adjustment of the Model 960 Micro Sweep at specified service intervals. Initially, 6 month intervals are recommended; however, actual experience within the user's environment may allow greater intervals.

The completion of these calibration procedures returns the instrument to correct calibration. All limits and tolerances given in these procedures are calibration guides and should not be interpreted as instrument specifications. Instrument specifications are given in Section 1 of this manual.

These procedures do not cover adjustments of the oscillator temperature compensation circuit (R165, R154, and R161) because these adjustments require specialized test and measurement equipment. These adjustment points have been painted over at the factory to maintain original factory settings and should need adjustment only as a result of catastrophic instrument failure. In this event, please refer the instrument to Wavetek's Customer Service department for factory calibration service.

After completing the calibration procedure, place SW2 in the following conditions:

SW2-1 Closed
SW2-2 Opened
SW2-3 Closed
SW2-4 Closed
SW2-5 Closed

Finally, verify that SW1 is set to the following conditions:

SW1-1 Closed
SW1-2 Closed
SW1-3 Opened
SW1-4 Opened
SW1-5 Closed

Table 5-2. Calibration Procedure

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
1	Verify Power Supply	Main Tuning: Full cw Start: Full ccw Stop/ΔF: Full cw Swp Time: Full cw RF Level: Full cw	Mode: CW M1: Off M2: Off M3: Off Ext Trig: Off Ext Level: Off RF On: On	TP3 TP39 (Ground)	None	– 16.2V	± 0.5V <100 mVp-p Line	Use DVM to measure voltage levels and oscilloscope to check 60 Hz line noise spikes
2				TP6		+ 16.2V	± 0.5V <100 mVp-p Line	
3				TP4		– 13.0V	± 0.5V <200 mVp-p Spike	Use DVM to measure voltage levels and oscilloscope to check 44 kHz noise spikes.
4				TP7		+ 13.0V	± 0.5V <200 mVp-p Spike	
5				TP5		– 6.3V	± 0.2V <400 mVp-p Spike	
6				TP8		+ 6.3V	± 0.2V <400 mVp-p Spike	

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
7	Set +10 V Reference	Main Tuning: Full cw Start: Full ccw Stop/ΔF: Full cw Swp Time: Full cw RF Level: Full cw	Mode: CW M1: Off M2: Off M3: Off Ext Trig: Off RF On: On	TP1	R3	+10.000V	±1 mV <1 mVp-p Noise	Check 60 Hz line noise in steps 7 and 8.
8	Verify +10V Buff			TP2	None	+10.000V	±10 mV <1 mVp-p Noise	
9	Set Display Zero Point	Main Tuning: Full ccw		Micro Swp Display	R13 Digital Control	0.00 GHz	Exactly	Observe Micro Sweep display and set R13 as close as possible to polarity close point.
10	Set Display Range	Main Tuning: Full cw			R14 Digital Control	Model 962: 3.10 GHz Model 964: 4.80 GHz Model 965: 5.50 GHz Model 967: 6.10 GHz		Observe Micro Sweep display and set R14 for the exact value specified.
11	Set Display Offset				R13 Digital Control	Model 962: 4.08 GHz Model 964: 8.45 GHz Model 965: 12.45 GHz Model 967: 18.05 GHz		Observe Micro Sweep display and set R13 for the exact value specified.
12	Verify Display Offset				None	Model 962: 0.95 GHz Model 964: 3.65 GHz Model 965: 6.95 GHz Model 967: 11.95 GHz		Observe Micro Sweep display and verify that reading is within ±1 LSD of specified value.
13	Set ΔF Minimum Deviation	Stop/ΔF: Full ccw	Mode: ΔF Swp Display Stop/ΔF: On.		R89 Marker	0.01 GHz	Exactly	Observe Micro Sweep display and set R89 for specified display reading.
14	Set ΔF Maximum Deviation	Stop/ΔF: Full cw			R88 Marker	Model 962: 3.10 GHz Model 964: 4.80 GHz Model 965: 5.50 GHz Model 967: 6.10 GHz		Observe Micro Sweep display and set R88 to read the difference beteen high and low end frequencies. For example, (962) 4.05-0.95 = 3.10 GHz.
15		Stop/ΔF: Full ccw			None	0.01 GHz	Exactly	Repeat steps 12, 14, and 15 until readings fall within the specified value.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
16	Verify Sweep Waveform	Swp Time: Full cw	Mode: S/S Swp	TP10 (Sweep Out) Waveform Generator	None	See Figure 5-5.		Use oscilloscope and verify sweep waveform.
17	Set Positive Peak				R220	3 ms flat spot. See Figure 5-5.		Use oscilloscope and set positive peak (+10V) (Chan 1) flat spot to 3 ms. This setting is not critical.
18	Set Negative Peak				R28	−10 mV	±10 mV	Use oscilloscope and set negative peak to −10 mV. It is important to set the peak as close to −10 mV as possible.
19	Set Minimum Sweep Time				R23	18 ms	+1/−2 ms	Use oscilloscope and set rising portion of modified sawtooth wave. See figure 5-5.
20	Verify Maximum Sweep Time	Swp Time: Full ccw (But not to Ext Tune)			None	≥20 s		Use oscilloscope to verify rising portion of modified sawtooth is greater than 20 s. See figure 5-5.
21	Verify WF Generator Blanking	Swp Time: Full cw		TP11	None	+2.5V (min)		Use oscilloscope to verify blanking pulse at TP11. SW1-2 and SW1-5 closed; rest open.
22	Verify Sweep Indicator							Observe Micro Sweep's sweep indicator blinks.
23	Set Negative Peak at Blanking Pulse				R210	0.0V	±20 mV	Use oscilloscope and set bottom of blanking pulse. See figure 5-5.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
24	Verify Z-Axis Output	Swp Time: Full cw	Mode: S/S Swp	Z-Axis Output BNC	R210	0.0V	±20 mV	Use oscilloscope to verify blanking pulse is present at Z-axis out (Rear Panel).
25	Verify External Trigger		Ext Trig: On		None			Observe Micro Sweep's sweep indicator stops blinking.
26	Verify External Trigger			Sweep Indicator				Short center conductor of Trig In BNC to ground. Observe Micro Sweep's sweep indicator indicates a sweep.
27	Set Sweep Control Gain		Power: Off					Turn power off. Remove Waveform Generator Board.
28								Connect dc voltage standard to TP38.
29			Power: On Mode: ΔF Swp					Turn power on. Wait 3 minutes for Micro Sweep to stabilize.
30		Stop/ΔF: Full cw						Connect a short between TP18 (−10V ref) and TP29 (gnd 2).
31								Set dc voltage standard to +10.000V; measure with DVM and note reading.
32				TP13 (Gain Out)	R202	−10.000V	±10 mV	Connect DVM to TP13 and adjust R202 for reading.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
33	Set ΔF Offset Offset	Stop/ΔF: Full cw	Power: On Mode: ΔF Swp	TP13	R203	0.00V	±10 mV	Set dc voltage standard for +5.000V. Remove the short between TP18 and TP29. Use DVM to set ΔF Sweep offset.
34	Set S/S Sweep Offset Cancellation	Stop/ΔF: Full ccw	Mode: S/S Swp		R201	0.00V	±10 mV	Set dc voltage standard for 0.000V.
35	Verify Sweep Circuit Performance		Power: Off		None			Turn power off, and replace Waveform Generator Board. Disconnect voltage standard.
36		Swp Time: Full cw Start: Full ccw Stop/ΔF: Full cw	Power: On Mode: S/S Swp RF On: On	TP16				Connect oscilloscope to TP16. Verify oscilloscope display modified sweep waveform. See figure 5-5.
37		Start: Full cw Stop/ΔF: Full ccw				See Comments		Verify oscilloscope displays inverted modified waveform. See figure 5-6.
38		Main Tuning: 2.500 for 962 6.050 for 964 9.700 for 965 15.000 for 967 Stop/ΔF: Full cw	Mode: ΔF Swp					Verify oscilloscope displays modified sweep waveform.
39		Stop/ΔF: Gradually rotate to full ccw.				+5.00V (at full ccw)	± 50 mV	Verify oscilloscope display modified sweep waveform that approaches a flat trace (full ccw).
40		Stop/ΔF: Full cw						

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
41	Verify Sweep Circuit Performance	Main Tuning: Full ccw	Mode: ΔF	TP16	R201	0.0V	± 50 mV	Verify oscilloscope displays negative peak of waveform does not go below 0.0V.
42		Main Tuning: Full cw			None	+ 10.00V	± 200 mV	Verify on oscilloscope positive peak of waveform does not exceed + 10V.
43			Display Start/ CF	Micro Sweep Display		Model 962: 4.050 GHz Model 964: 8.450 GHz Model 965: 12.450 GHz Model 967: 18.050 GHz		Verify Micro Sweep's display reads specified value.
44			Display Stop/ ΔF			Model 962: 3.10 GHz Model 964: 4.80 GHz Model 965: 5.50 GHz Model 967: 6.10 GHz		Verify Micro Sweep's display reads specified value.
45	Set Marker Zero		Mode: CW					Connect a jumper between E10 (left side FP Swp Time control) and ground.
46								Connect dc voltage standard to Ext Tune In BNC. Set the dc standard to + 5.0 mV.
47			M1: Press					Micro Sweep front panel. M1 flashes at low duty cycle (mostly off).
48			On/Off: Press once Update			0.950 GHz for 962 3.650 GHz for 964 6.950 GHz for 965 11.950 GHz for 967		Micro Sweep front panel. M1 flashes at high duty cycle (mostly on). M1 Swp display reads close to specified value. Mkr LED indicator lit.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
49	Verify Marker Pulse Level	Main Tuning: Full cw	Update: Press	TP21 (M1 Out) Marker	None	See Comments		Connect oscilloscope to TP21. Scope settings Coupling: dc Sens: 10 mV/ Div. Verify oscilloscope close up dc level at specified value.
50	Set Noise Transition				R216			Use oscilloscope to set for a noise transtion from 0 to +10.0 mV as R216 is rotated.
51					None			Set dc voltage standard to 0.00 V. Note frequency shown on this Micro Sweep display.
52			Mode: CW			Set to reading in step 51	±1 digit	Verify Micro Sweep display shows some reading as in step 50 ± 1 digit.
53								Disconnect jumper between E10 and ground. Disconnect voltage standard.
54	Set Marker Tracking	Main Tuning: Full cw minus ¼ turn.		Display				Note exact reading on display.
55			M1: Press Update: Press		R76	See Comments		Adjust to exactly equal to reading in step 54.
56		Main Tuning: Center of Frequency Band.			None			Note exact reading on display.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
57	Set Marker Tracking	Main Tuning: Center of frequency band.	Mode: CW	Display	None	See Comments		Verify reading is same as step 56 ± 2 digit.
58	Set Marker Pulse Width	Start: Full ccw. Stop: Full cw.	Mode: S/S Swp	Display and Oscillo-scope				
59		Main Tuning: Set near low frequency of band.						
60		Main Tuning: Set near center frequency of band	M2: Press On/Off: Press Update: Press					
61		Main Tuning: Set near near high frequency	M3: Press On/Off: Press Update: Press					
62				Swp Out. Connect scope Channel 1 to Swp Out, Trigger on Channel 1.				
63				TP22. Connect scope Channel 2 to TP22. Adjust scope sweep as needed.				
64					R213. Adjust for three visible pulses on Channel 2. Verify pulse high +4.5V minimum and low of 0.3V maximum. Adjust R213 for a 100μs ± 50μs pulse.			
65	Set Zero Level	Main Tuning: Set to center of frequency band.	Mode: CW M1: Press On/Off: Press once M2: Press On/Off: Press once M3: Press On/Off: Press once Ext Lev: Off (LED off) Lev LED: Off.	TP24	R124	0.000V	±2 mV	Connect dc voltmeter to TP24. Places unit in unleveled operation.
66	Set Full Output			TP23	R130	0.000V	±2 mV	Connect dc voltmeter to TP23.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
67	RF Output Power	Main Tuning: Rotate from full ccw position to full cw position.		RF Output	None	12 dBm	(Minimum)	Connect microwave power meter as shown in figure 5-7. Some micro sweeps have 70 mW of output power; use fixed pads as necessary.
68	Set Maximum Attenuation	Main Tuning: Set to center of frequency band.				See Comments		Note RF output level.
69		RF Level: Full ccw			R112	35 dB	± 7 dB	Set R112 for 35 dB less than reading in step 68.
70		RF Level: Rotate full cw and back to full ccw.			None			Verify level range is 35 ± 7 dB.
71	Verify External Control	RF level: Full cw						Connect −10.0 Vdc supply to AM In. Verify output level is −35 ± 7 dBm.
72	Set Leveling Circuit	Ext Level: On (See comments)			R128	+10 dBm	± 0.5 dBm	Connect equipment as shown in figure 5-8. If Internal Leveling Option (001) is installed, leave Ext Level off.
73		Start: Full ccw Stop/ΔF: Full cw Swp Time: Mid-range	Mode: S/S Swp			+ 10 dBm	± 0.1 dBm	Set R128 for + 10 ± 0.1 dBm at lowest point on frequency band.
74					None	Flat ± 0.8 dBm (Externally leveled) Flat ± 0.9 dBm (Internally leveled)		Verify flat response.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
75	Setting Frequency	Main Tuning: Full ccw	Mode: CW	RF Output	R168	Model 962: 1.0 GHz ±0.001 GHz Model 964: 3.7 GHz ± 0.001 GHz Model 965: 7.0 GHz ± 0.001 GHz Model 967: 12.0 GHz ± 0.001 GHz		Connect as shown in figure 5-9. Caution: Some Micro Sweeps may have output level of +18 dBm. Do not exceed input power to frequency counter. Adjust R168 for low frequency reading.
76		Main Tuning: Full cw			R177	Model 962: 4.0 ± 0.001 GHz Model 964: 8.4 ± 0.001 GHz Model 965: 12.4 ± 0.001 GHz Model 967: 18.0 ± 0.001 GHz		Adjust R177 for high frequency reading.
77	Verify Sweep Output	Start: Full ccw Stop/ΔF: Full cw Swp Time: Full cw	Mode: S/S Swp	Sweep Out/Ext Tune In	None	See Comments		Verify 0 to +10.0 ± 0.02V modified sawtooth waveform at Sweep Out. Connect oscilloscope to Sweep Out BNC.
78	Verify Z-Axis Output			Z-Axis Out				Connect oscilloscope to Z-Axis Out BNC. Verify 0 to +3.5V (nominal) blanking pulse. Verify 0 to −4.0V (approximately) marker pips if markers are turned on. Signal between marker or retrace pulse should be 0.0 ± 100 mV.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
79	Verify FM Input	Main Frequency Tuning: Set to center of frequency band.	Mode: CW	RF Output	None	See Comments		Connect a counter to RF Output. Connect +4.0 Vdc to FM In BNC, frequency change +5.5 MHz (Minimum). Connect −4.0 Vdc to FM In BNC, frequency change −5.5 MHz (Minimum)
80	Verify Frequency Pulling	RF Level: Rotate ccw.						As RF level control is rotated ccw, verify frequency does not vary more than 1% of frequency setting. Repeat at several other points of frequency band.
81	Verify Spurious Signals	RF Level: Full cw.						Connect RF Output to Spectrum Analyzer. Caution: Do not exceed recommended input to analyzer. Verify spurious signals at least −55 dBc.
82	Verify Stability	Main Tuning: Rotate slowly across band.						Verify signal does not break up or show instability.
83	Verify Harmonic Signal							Verify harmonic signal is at least: −12 dBc for Model 962, −20 dBc for all other models.

Table 5-2. Calibration Procedure (Continued)

Step	Step Name	Control Setting	Switch Settings	Measurement				Comments
				Test Point	Adjust	Nominal Value	Tolerance	
84	Verify Residual FM	Main Tuning: Rotate slowly across band.	Mode: CW	RF Output	None	See Comments		Verify residual FM is less than: 16 kHz p-p for Model 962. 30 kHz p-p for Model 964. 40 kHz p-p for Model 965. 50 kHz p-p for Model 967.

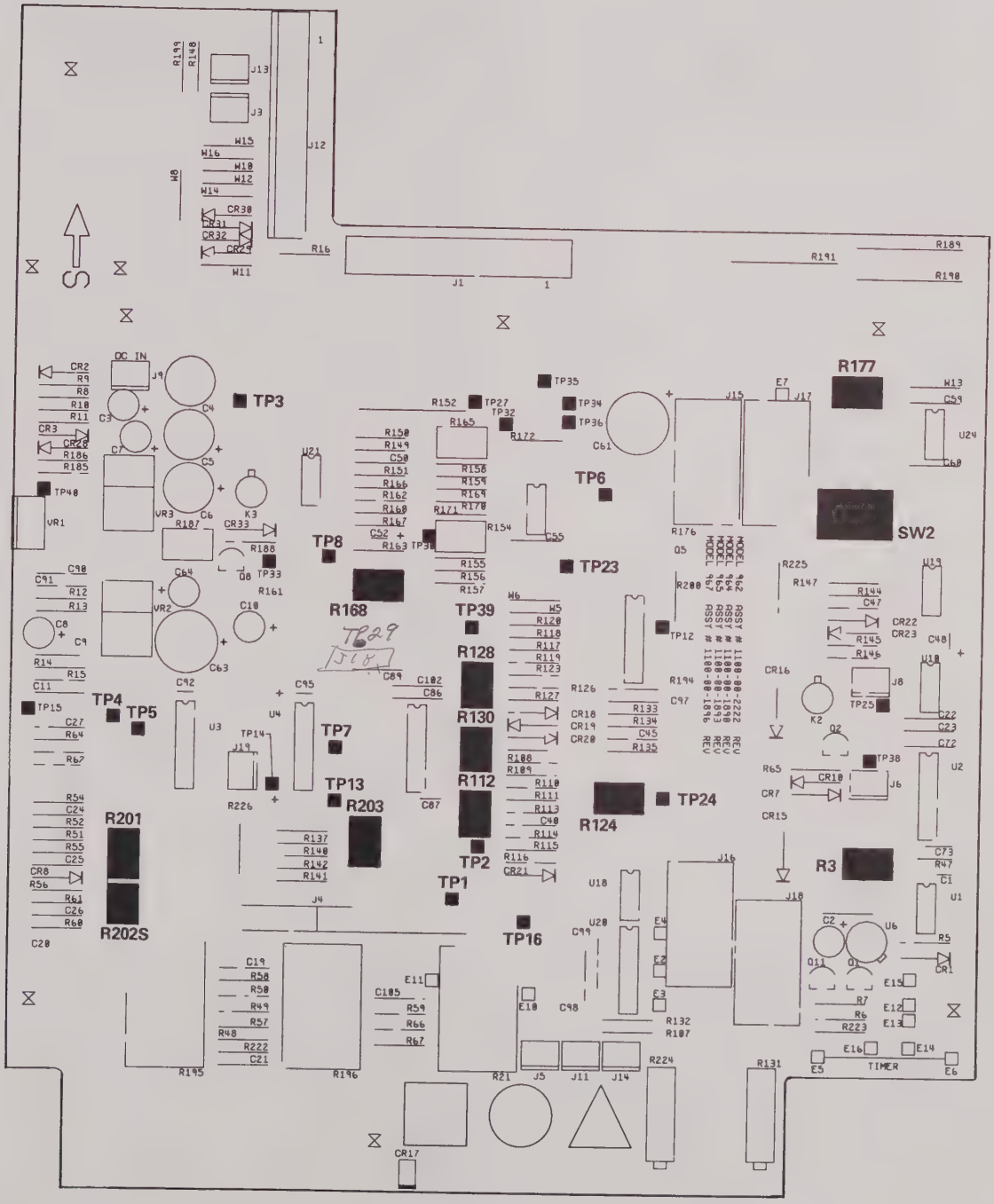


Figure 5-1. Main Board

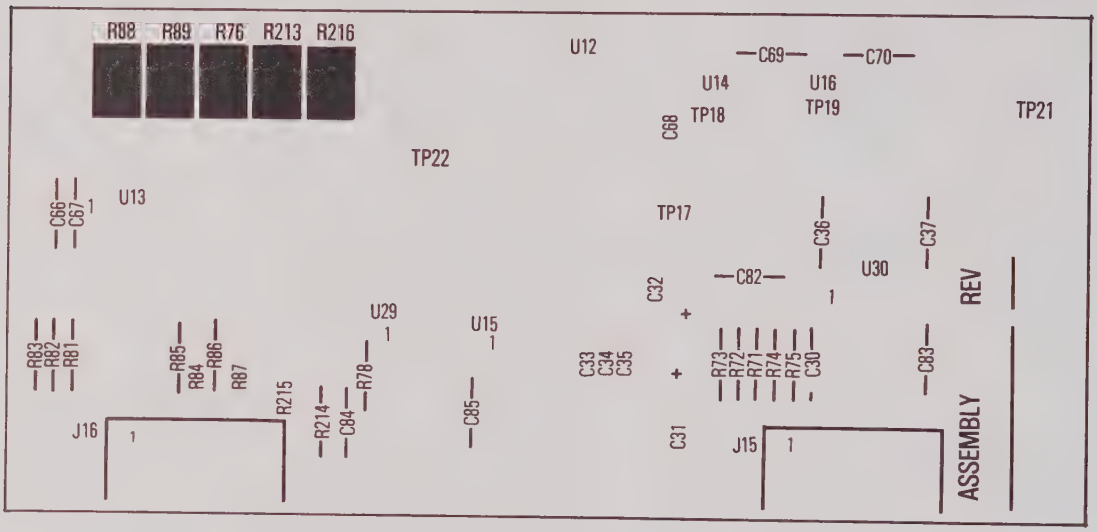


Figure 5-2. Marker Board

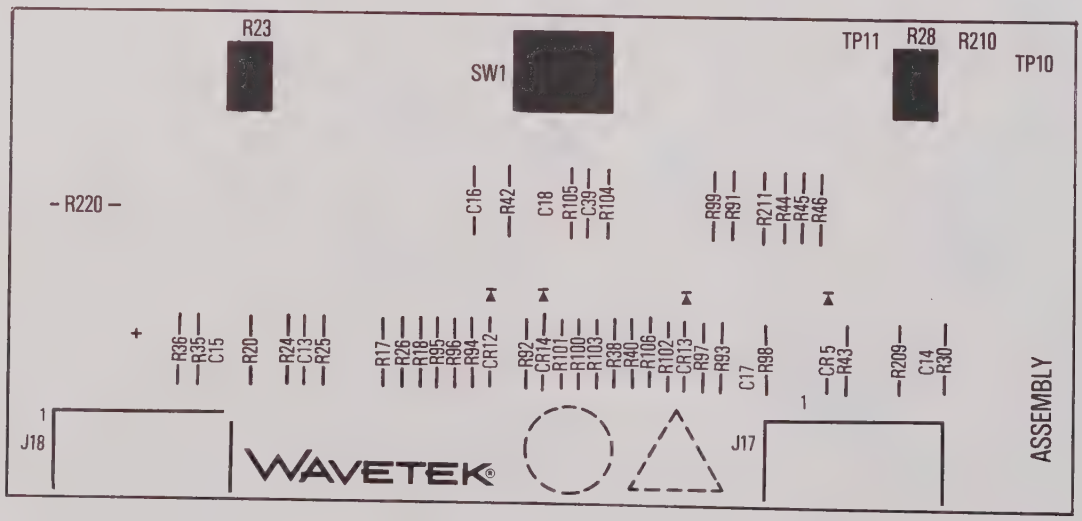


Figure 5-3. Waveform Generator Board

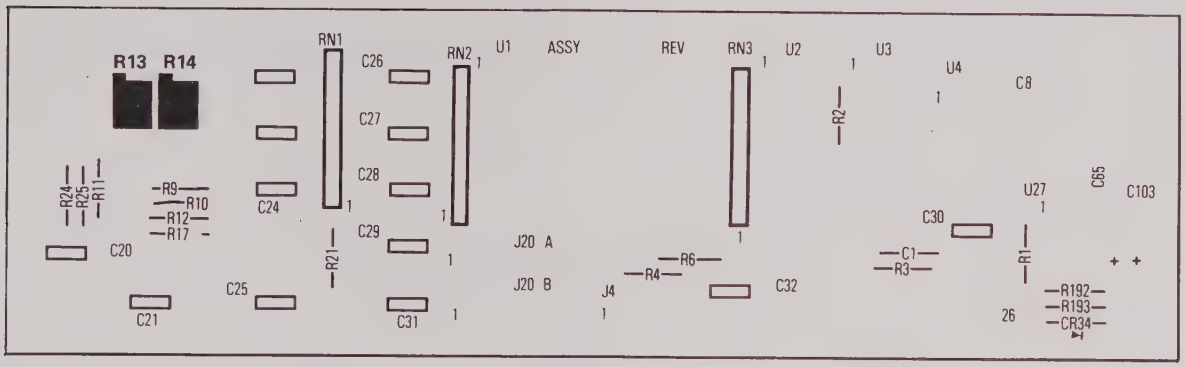


Figure 5-4. Digital Control Board

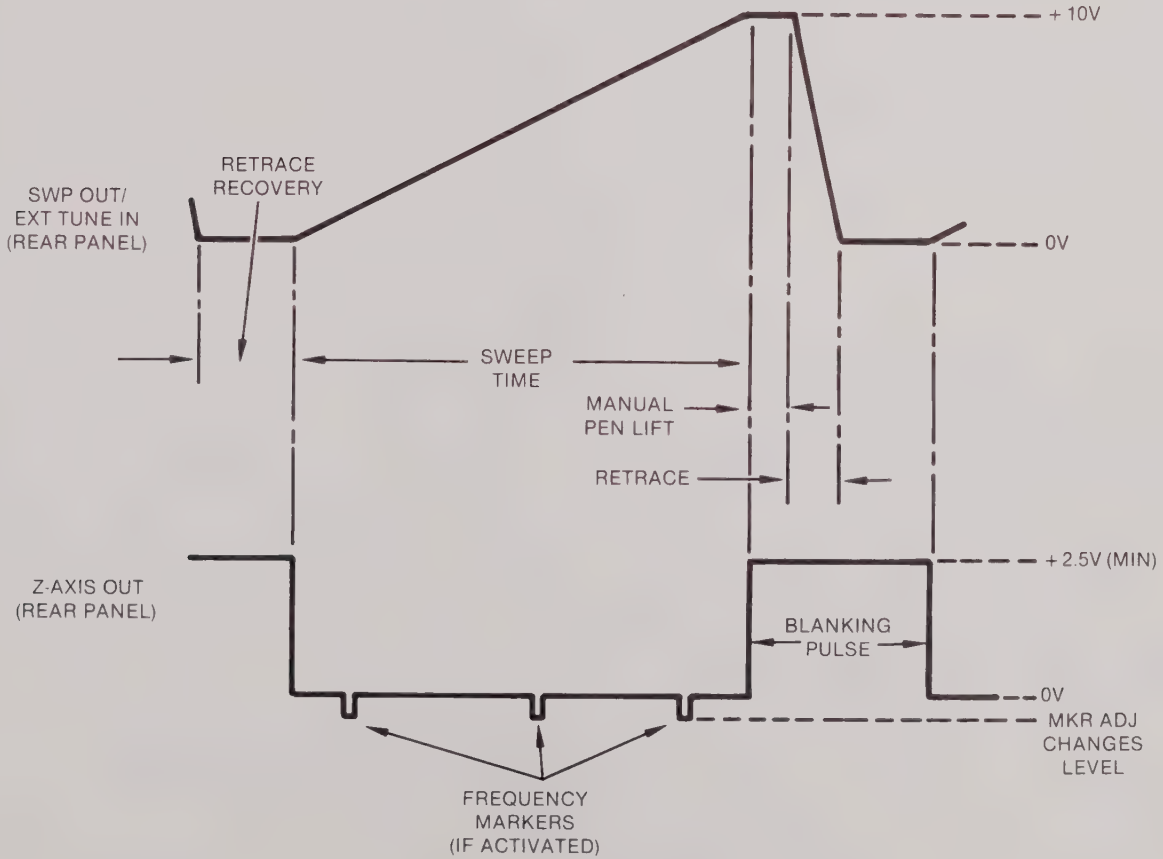


Figure 5-5. Sweep Sawtooth and Blanking Pulse Output

Figure 5-6. Inverted Sweep Sawtooth

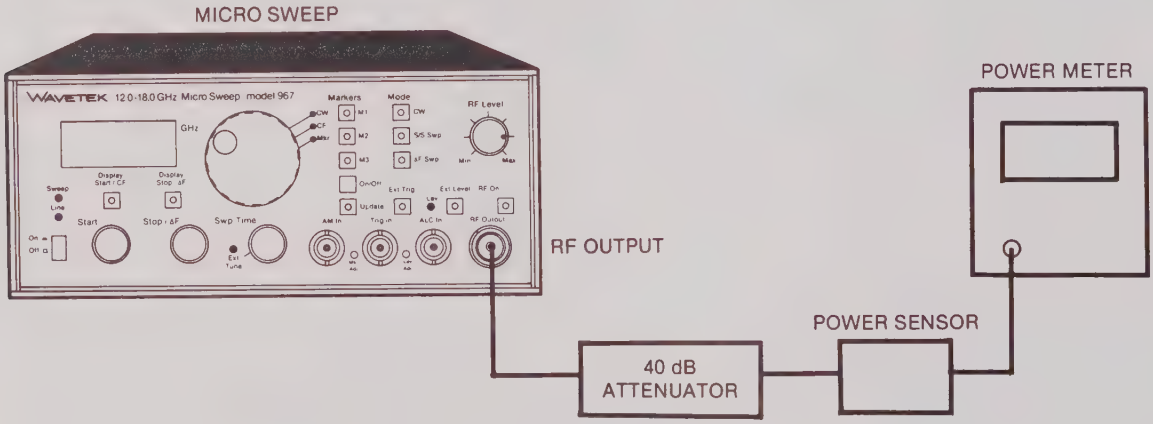


Figure 5-7. RF Power

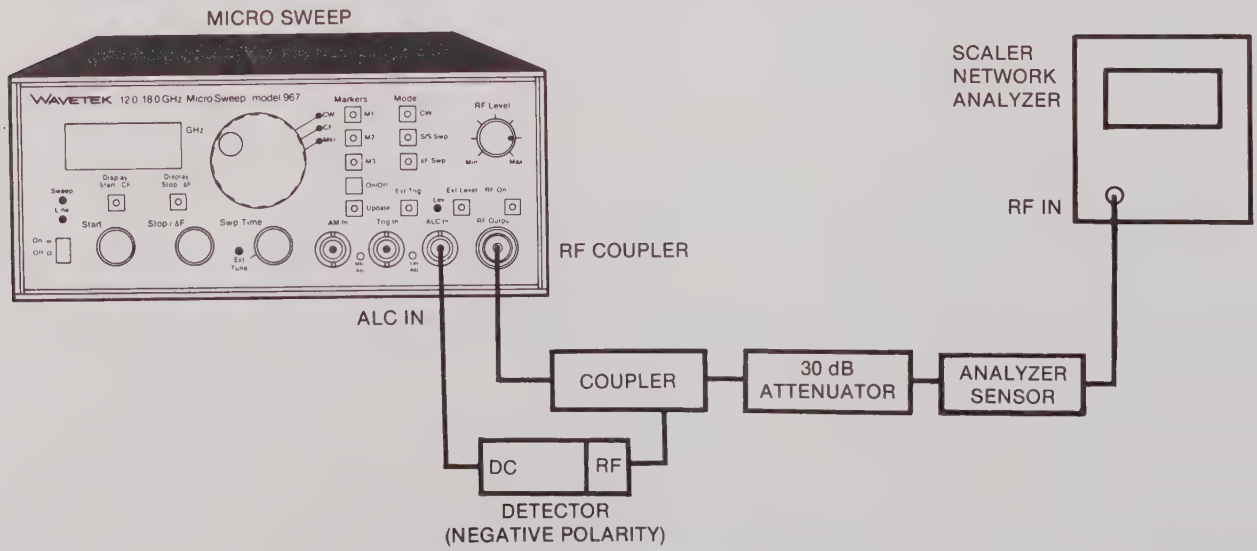


Figure 5-8. External Level Control

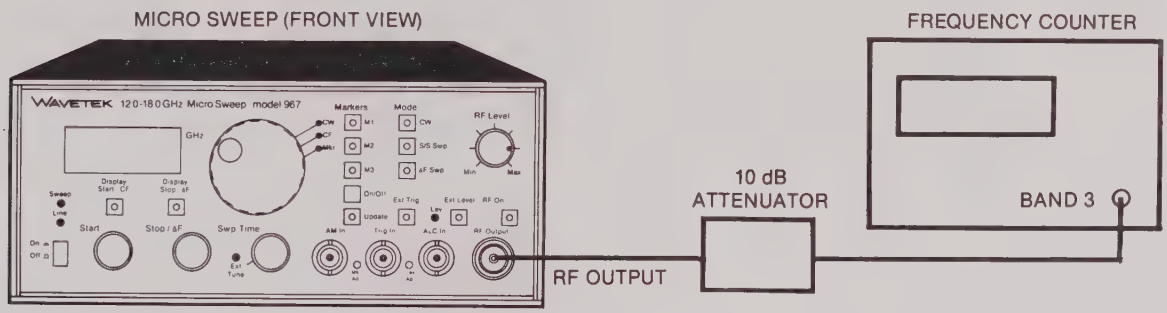
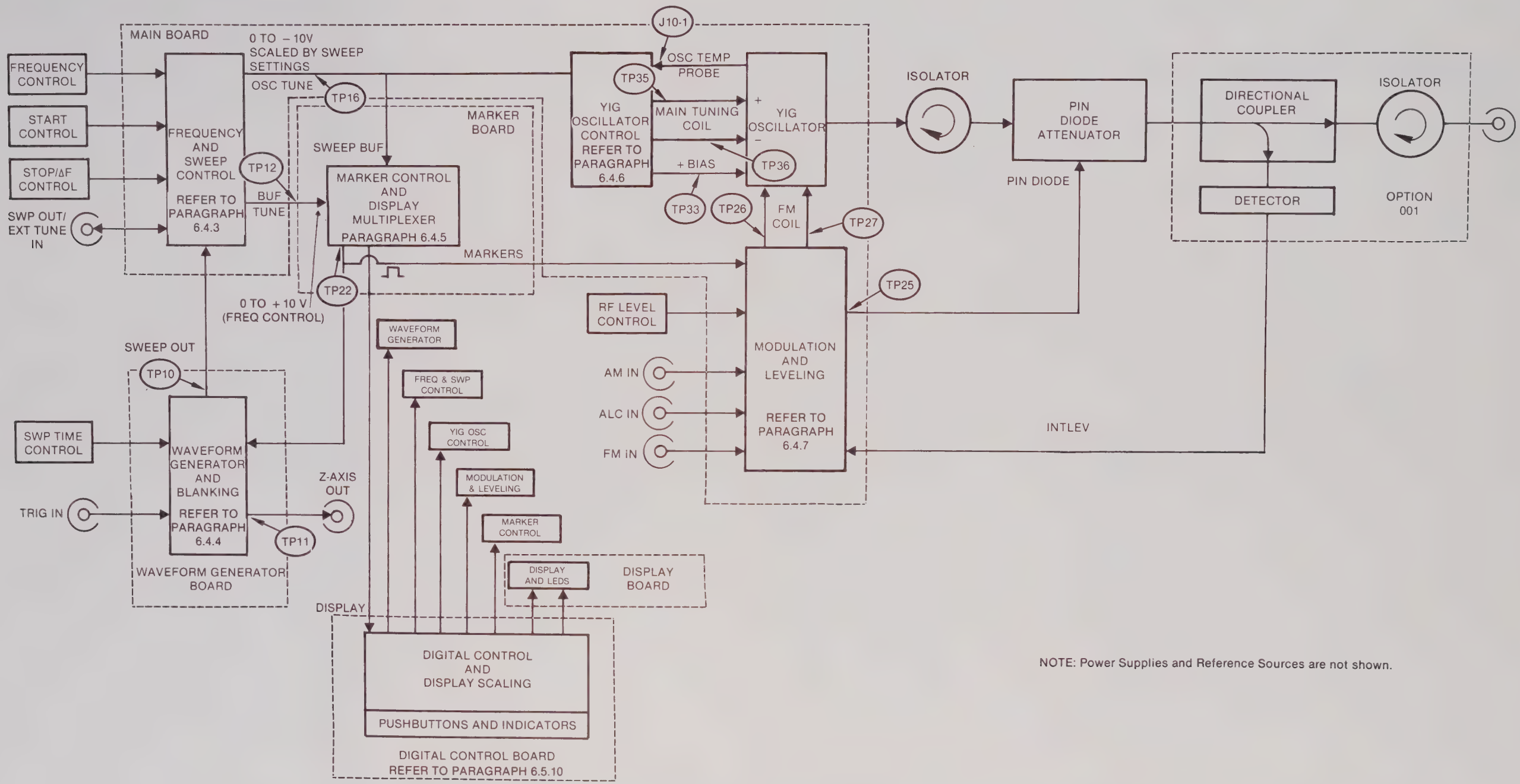


Figure 5-9. Frequency Measurement



NOTE: Power Supplies and Reference Sources are not shown.

Figure 6-1. Troubleshooting Block Diagram

SECTION 6
TROUBLESHOOTING

6.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached to the instrument to minimize turnaround time.

6.2 BEFORE YOU START

Since no troubleshooting guide can possibly cover all the potential problems, the aim of this guide is to give a methodology which, if applied consistently, will lead to the problem area. Therefore, it is necessary to familiarize yourself with the instrument by reviewing the general and detailed circuit descriptions (Section 4) in conjunction with the schematics (Section 7). Successful troubleshooting depends upon understanding the circuit operation within each functional block as well as the interrelationship of the blocks.

The intent of this section is to provide the information required to return this instrument to proper operation. Information is divided into two parts. Part one contains the overall instrument troubleshooting block diagram (figure 6-1) and related text, which is useful in isolating major defective blocks within the Micro Sweep. Part two consists of a series of circuit guides (paragraph 6.5) organized by circuit blocks; each guide provides settings and measurements for troubleshooting that block. Also, each circuit guide references related schematics, circuit descriptions, and calibration procedures.

Before removing the Micro Sweep's covers to begin the troubleshooting process, verify the instrument's controls are set correctly. For more information about operating the Micro Sweep, refer to Section 3 of this manual. For example, selecting the CW mode inhibits the sweep function. Furthermore, verify the instruments ac voltage setting is correct for the primary power source; refer to paragraph 2.2.1. Finally, inspect for an incorrect or blown fuse; refer to paragraph 2.2.1.

6.3 ISOLATING A PROBLEM

If the problem still exist after checking the Micro Sweep with the covers on, remove the top cover as follows.

1. Disconnect the Micro Sweep from the power source.
2. To remove the top cover, remove the two screws at the rear of the cover and lift the cover off. It is usually possible to set the top cover with the modular power supply cable still attached to the left of the instrument. If the top cover needs to be disconnected from the Micro Sweep, refer to figure 2-2.
3. When finished checking and repairing the instrument, replace the top cover.

Once the cover is removed, inspect the instrument's components, wiring, and circuit boards for heat damage. Next, rule out calibration as a possible problem. For instance, if the output frequency does not agree with the displayed frequency it is quite possible that resistors R13 or R14 on the Digital Control board need adjustment. Finally, check the power supply (refer to paragraph 6.5.1) and reference (refer to paragraph 6.5.2) voltages.

To successfully troubleshoot this instrument, locate the faulty block, analyze the block, and locate and replace the faulty component.

To locate the faulty block, review figure 6-1 to establish the instrument's signal flow. Next, measure the block's outputs (using the paragraphs referenced on figure 6-1) until the defective block is located. Certain blocks are checked under different several different conditions. Figures 6-2, 6-3, 6-4 shows test points that are useful in isolating blocks.

Once the block is isolated, refer to the appropriate circuit guide; see table 6-2. Set the controls as instructed and take the measurements given to check out the block. All measurements are referenced to ground (TP39). Use the assembly drawing referenced in the circuit guides to locate test points. Paragraph 6.6 gives component troubleshooting information.

6.4 BLOCK ISOLATION

To isolate a problem within the micro sweep, check the test points (see figure 6-1) and refer to the referenced paragraphs.

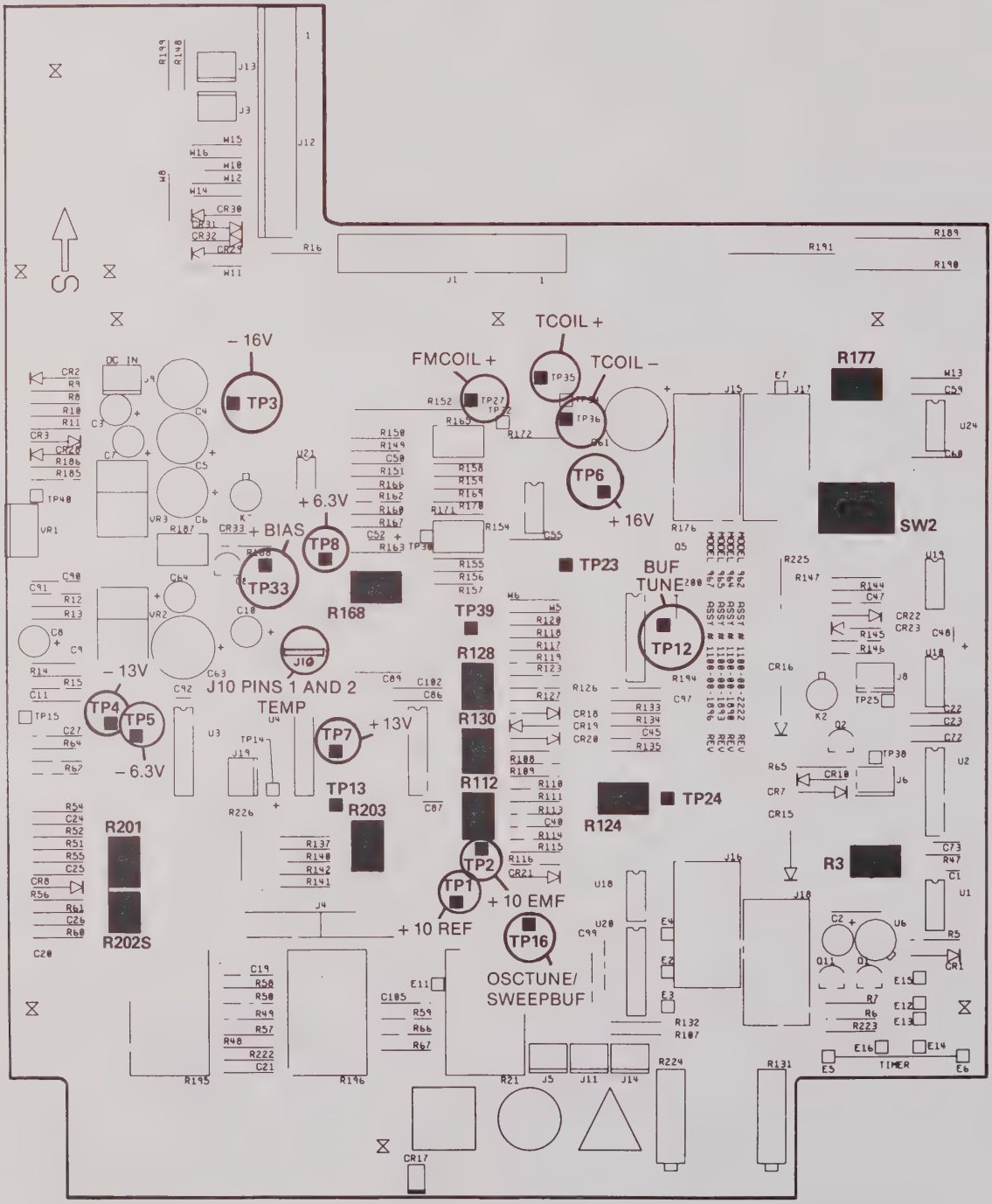


Figure 6-2. Main Board

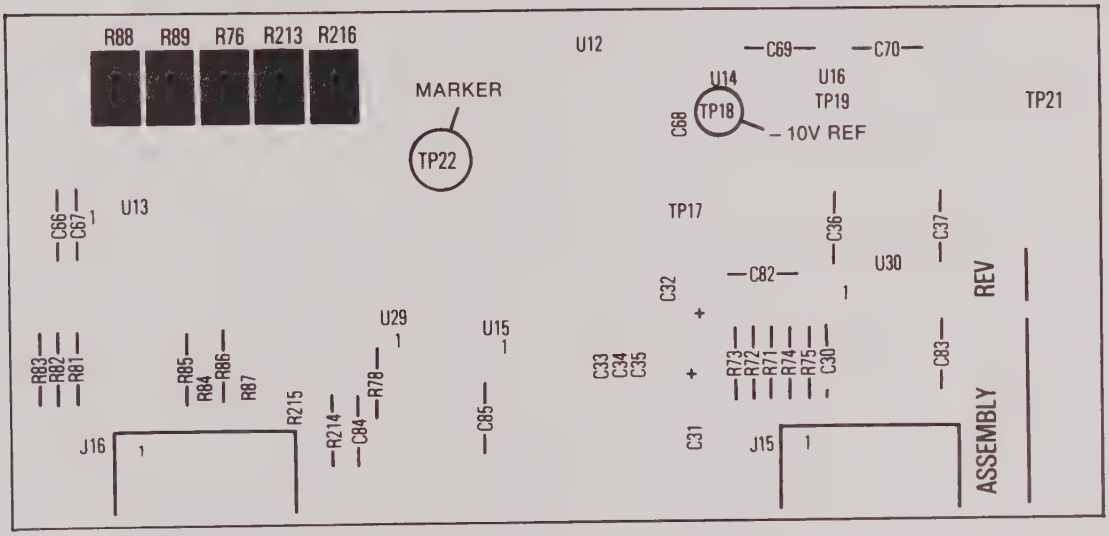


Figure 6-3. Marker Board

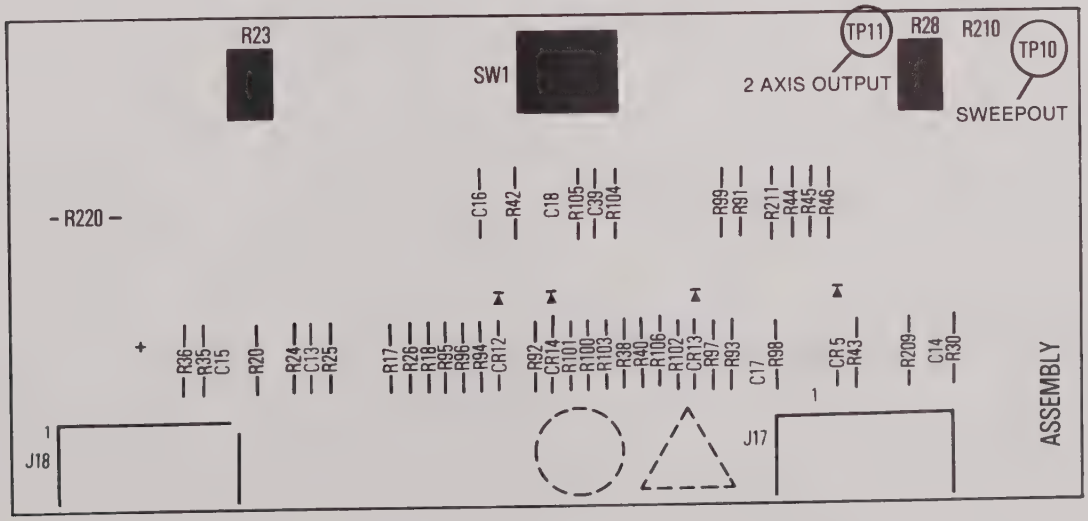


Figure 6-4. Waveform Generator Board

6.4.1 Power Supplies

To check out the power supplies, turn on the instrument's power and set it to the CW mode. Refer to paragraph 6.5.1.

6.4.2 References

To check out the references, turn on the instrument's power and set it to the CW mode. Refer to paragraph 6.5.2.

6.4.3 Frequency and Sweep Control Block

Mode: CW
TP12 BUF_TUNE for a 0 (Main Tuning Knob full ccw) to +10V (Main Tuning full cw).
Probable operation problems: Swp Time set to Ext Tune.

Mode: ΔF or S/S Sweep
TP16SWEEPBUF for a modified ramp (0 to +10V peak max) variable depending on Start, stop/ΔF and main tuning knob settings.
Probable operation problems: Swp Time set to Ext Tune. Mode set to CW. External Trigger set to on.

6.4.4 Waveform Generator Block

TP10 SWEEPOUT (Waveform Generator Board) 0 to +10V modified sweep ramp; sweep time varies <20 ms to >20s.

Probable operation problems: Mode set to CW. External Trigger turned on.

TP 11 Z-Axis Output (Waveform Generator Board) <0.5V to > +2.5V rectangular blanking pulse. Make sure S1-2 and S1-5 are closed.
Hint: check at full band sweep (Mode:S/S Sweep, Start: full ccw, Stop/ΔF: full cw).
Probable operation problems: Mode set to CW. External Trigger turned on. Markers turned off. For markers, sweep width too narrow.

6.4.5 Marker Control Block

TP 22 MARKERS (Marker Board) 1, 2, or 3 rectangular pulses < +0.5V to >2.5V. Makers must be set and turned on.
Hint: check at full band sweep (Mode:S/S Sweep, Start: full ccw, Stop/ΔF: full cw).
Probable operation problems: Markers turned off. Mode set to CW. Sweep width set too narrow.

6.4.6 YIG Oscillator Control Block

TP 35 T COIL + (Main Board)—see table 6-1.
Probable operation problem: Sweep Mode.

TP 33 +BIAS (Main Board) +13V ±100mV.
Probable operation problems: RF On turned off.

Oscillator Temperature Probe input: J10-1 (Main Board) +5.05 ±0.25V; J10-2 +0.3 ±0.050V.

Table 6-1. YIG Control

Test Pont	Model			
	962	964	965	967
TP 35 (Main Tuning full cw)	−3.7 to −4.8V	−3.8 to −4.5V	−3.4 to −3.9V	−5.1 to −5.6V
TP 35 (Main Tuning full ccw)	−0.8 to −1.2V	−1.5 to −1.9V	−1.9 to −2.2V	−3.6 to −4.7V

6.4.7 Modulation and Leveling

TP26 FMCOIL− (Main Board) ±2.5V triangle
TP27 FM COIL+ (Main Board) ±2.5V triangle
Connect FM In to ±2.5V triangle source.
Probable operation problems: No input FM signal.

TP25 PINDIODE (Main Board) 0.0 ±0.2V (RF Level: full cw); −0.75 ±0.1V (RF Level: full ccw) Mode: CW and No external leveling (+0.75V for Model 962 only).
Probable operation problems: Input to AM In connector, automatic leveling on.

Table 6-2. Circuit Guides

Circuit Guide	Paragraph
Power Supplies	6.5.1
Modular Power Supply	6.5.1.1
±13V Regulators	6.5.1.2
±6.2V Regulators	6.5.1.3
Reference Block	6.5.2
10V Reference	6.5.2.1
+10V Buffered Reference	6.5.2.2
−10V Reference	6.5.2.3
Digital Control Block	6.5.3
Digital Control	6.5.3.1
Blink Timer	6.5.3.2
Waveform Generator Block	6.5.4
Constant Current Source	6.5.4.1
Comparator	6.5.4.2

Table 6-2. Circuit Guides (Cont)

Circuit Guide	Paragraph
Waveform Generator Block (Cont)	
Sweep Shaper	6.5.4.3
Top Flat Comparator	6.5.4.4
Bottom Flat Comparator	6.5.4.5
Monostable Retrace Comparator	6.5.4.6
Summing Comparator	6.5.4.7
Z-Axis Switching and Buffer	6.5.4.8
Frequency and Sweep Control Block	6.5.5
Frequency Control and Buffer	6.5.5.1
Sweep Stop/ΔF	6.5.5.2
Start	6.5.5.3
CF Buffer	6.5.5.4
ΔF Clipper	6.5.5.5
Start/Stop Sweep Buffer	6.5.5.6
Display Start/Stop Controls	6.5.5.7
External Tune Switching	6.5.5.8
YIG Oscillator Control Block	6.5.6
Temperature Compensation	6.5.6.1
YIG Main Tuning Coil Driver	6.5.6.2
Oscillator Bias Supply	6.5.6.3
YIG Oscillator	6.5.7
Modulation and Leveling Block	6.5.8
RF and AM Input Summing Amplifier	6.5.8.1
PIN Diode Attenuator Driver	6.5.8.2
Automatic Level Control	6.5.8.3
FM Coil Drive	6.5.8.4
Marker Control Block	6.5.9
Marker A to D and D to A Conversion	6.5.9.1
Marker Enable Decoder	6.5.9.2
Marker Sweep Comparator	6.5.9.3
Transition Detector	6.5.9.4
Display Block	6.5.10
Voltmeter and Display	6.5.10.1
Offset and Scaling Network	6.5.10.2
Display Multiplexer	6.5.10.3

6.5 TROUBLESHOOING GUIDES

6.5.1 Power Supplies

6.5.1.1 Modular Power Supply

Related information in this manual.
Schematic: None.
Circuit Description: Paragraph 4.2.1.1.
Calibration Procedure: None.

Set the Micro Sweep's front panel controls and pushbuttons as shown and perform the checks in table 6-3.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-3. Modular Power Supply

Test Point	Voltage	Tolerance	Line Noise
TP 6	+16.2V	±0.5V	<100 mVp-p
TP 3	−16.2V	±0.5V	<100 mVp-p

6.5.1.2 ±13V Regulators

Related information in this manual.
Schematic: 0103-00-1848 Sheet 2.
Circuit Description: Paragraph 4.2.1.2
Calibration Procedure: Table 5-2, steps 3 and 4.

Set the controls as shown in paragraph 6.5.1.1 below and make the checks in table 6-4.

NOTE

The 3-terminal regulator ICs are found on the rear panel. The input and output connections, to filter capacitors and output level setting voltage dividers on the main circuit board, are made through connector J12.

Table 6-4. ±13V Regulator

Test Point	Voltage	Tolerance	Line Noise
J12-8/TP6	+16.2V	±0.5V	<100 mVp-p
TP 7	+13.0V	±0.5V	<100 mVp-p
J12-6	1.25V (±50mV) less positive than J12-7		
J12-2/TP3	−16.2V	±0.5V	<100 mVp-p
TP 4	−13.0V	±0.5V	<100 mVp-p
J12-4	1.25V (±50mV) less negative than J12-5		

6.5.1.3 ±6.3V Regulators

Related information in this manual.
Schematic: 0103-00-1848 Sheet 2.
Circuit Description: Paragraph 4.2.1.3.
Calibration Procedure: Table 5-2, steps 5 and 6.

Set the controls and pushbuttons as shown, and make the checks in table 6-5.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-5. ±6.3V Regulator

Test Point	Voltage	Tolerance
VR1-3	+13.0V	±0.5V
TP 8	+6.3V	±100 mV
VR1-1	1.25 (±50 mV) less than VR1-2	
VR2-2	−13.0V	±0.5V
TP 5	−6.3V	±100 mV
VR2-1	1.25V (±50 mV) less than VR5-3	

NOTE

U19 and U21 are the most likely places to look for excessive current drain on these regulators.

6.5.2 References

6.5.2.1 +10V Reference

Related information in this manual.
Schematic: 0130-00-1848 Sheet 1.
Circuit Description: Paragraph 4.2.2.1.
Calibration Procedure: Table 5-2, step 7.

Set the controls and pushbuttons as shown below, and make the measurements as shown in table 6-6.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-6. +10V Reference Supply

Test Point	Voltage	Tolerance
U1-6	+10.6V	±0.2V
U1-3	+6.9V	±0.35V
U1-2	±10 mV of U1-3 value	
TP 1	+10.00V	±1mV (Ref: Table 5-2 step 7)

6.5.2.2 +10V Buffered Reference

Related information in this manual.
Schematic: 0103-00-1848 Sheet 1.
Circuit Descritpion: Paragraph 4.2.2.2.
Calibration Procedure: Table 5-2, step 8.

Set the pushbuttons and controls as shown, and make the checks in table 6-7.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-7. +10V Buffered Supply

Test Point	Voltage	Tolerance
TP 1	+10V	±1mV
TP 2	+10V	±10 mV
U2C-8	+10.7V	±100 mV
Q11 Collector	+13V	±0.5V

6.5.2.3 −10V Reference

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraph 4.2.2.3.
Calibration Procedure: None.

Set the controls and pushbuttons as shown, and make the checks in table 6-8.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-8. −10V Reference Supply

Test Point	Voltage	Tolerance
U30B-6	0V	±25 mV
TP 18	−10V	±200 mV
U30B-5	0.0V (ground)	±25 mV

6.5.3. Digital Control Block

6.5.3.1 Digital Control

Related information in this manual.
Schematic: 0103-00-1857 Sheet 1.
Circuit Description: Paragraph 4.2.3.
Calibration Procedure: None.

Tables 6-9, 6-10, 6-11 show the logic states for the control lines within the Micro Sweep. When a front panel pushbutton is pressed, the appropriate input to the programmable array logic ICs goes high causing the appropriate control lines to change. Figure 6-5 shows the timing relationship of the Digital Control Clock.

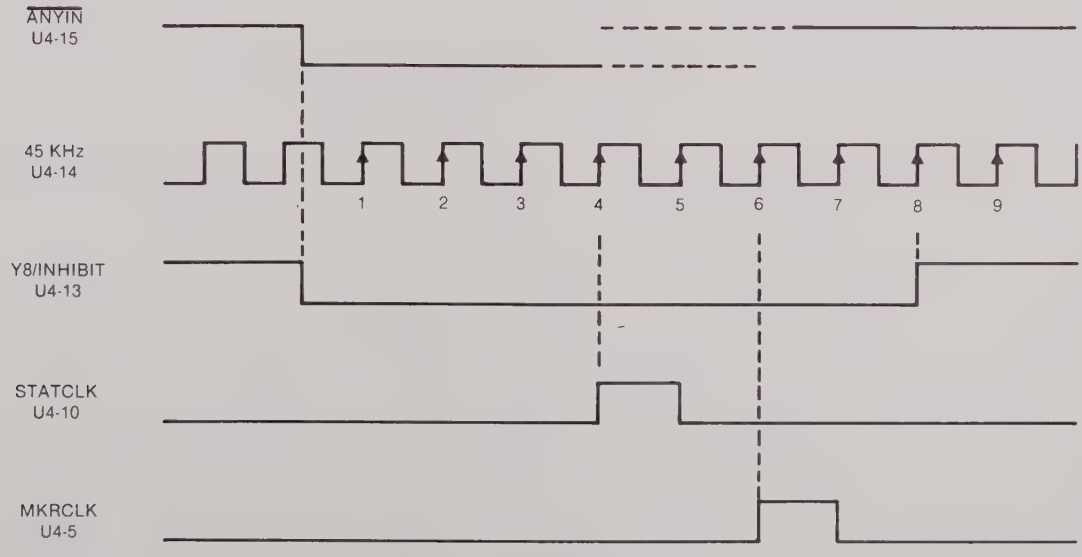


Figure 6-5. Digital Clock Timing

Table 6-9. Control Lines

Control Line	Description	Destination
$\overline{\text{UPDATE}}$, $\overline{\text{MKRSET}}$, J4-4	Goes low when Update pushbutton pressed.	
$\overline{\text{LEV}}$, J4-6	Goes low when Ext Level pushbutton pressed.	Automatic Level Control
$\overline{\text{RF\_\_LITE}}$, J4-5	Goes low when RF On pushbutton pressed.	RF On Control
EXTTO, U1-15	Toggles high when Ext Trig pushbutton pressed.	U3
MODE 1, J4-2 ($\overline{\text{S/S LITE}}$)	Low order bit for mode control; see table 6-10.	PAL U3 Sweep Stop/ΔF, Sweep Selector
MODE 2, J4-10 ($\overline{\text{DF LITE}}$)	High order bit for mode control.	Sweep Stop/ΔF, Sweep Selector
ANYMODE, U1-19	Pulses high when any pushbutton to PAL U1 pressed.	U2
$\overline{\text{ANYIN}}$, U1-12	Goes low when any pushbutton on front panel is pressed.	U4-15
DM3, J4-11 DM2, J4-12 DM1, J4-13	Display mode control bits; see table 6-11.	U3 Marker DAC Display Multiplexer
$\overline{\text{M3}}$, J4-14 $\overline{\text{M2}}$, J4-15 $\overline{\text{M1}}$, J4-16	Goes low when M3 (Marker) turned on. Goes low when M2 (Marker) turned on. Goes low when M1 (Marker) turned on.	U3 Comparator Marker Output
$\overline{\text{CW LITE}}$	Goes low when CW Mode selected.	Voltmeter/Display Comparator Positive Peak Comp. CW/SWEEP Selector
SWEEP, J20B-7	Goes high when any of the sweep modes are selected.	Voltmeter/Display
$\overline{\text{EXTT}}$, J4-20	Goes low when External Trigger selected. Only active in sweep modes.	Trigger Control
$\overline{\text{M3D}}$, U3-14 $\overline{\text{M2D}}$, U3-13 $\overline{\text{M1D}}$, U3-12	Controls marker LEDs; see figure 6-6.	Marker LEDs

Table 6-10. Mode Logic

State	Mode 1	Mode 2
Display Test	0	0
Start/Stop	1	0
ΔF	0	1
CW	1	1

Table 6-11. Display Frequency Logic

Displayed Frequency	DM1	DM2	DM3
ΔF	0	0	0
M1	1	0	0
M2	0	1	0
M3	1	1	0
STOP	0	0	1
Start	1	0	1
CF	0	1	1
CW	1	1	1

6.5.3.2 Blink Timer

Related information in this manual.
Schematic: 0103-00-1857 Sheet 2.
Circuit Description: Paragraph 4.2.3.5.
Calibration Procedure: None.

Refer to paragraph 4.2.3.5 of the circuit description for details on the blink timer.

6.5.4 Waveform Generator

6.5.4.1 Constant Current Source

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.1.
Calibration Procedure: Table 5-2, step 19.

Set the controls as shown, and take the measurements listed in table 6-12.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw

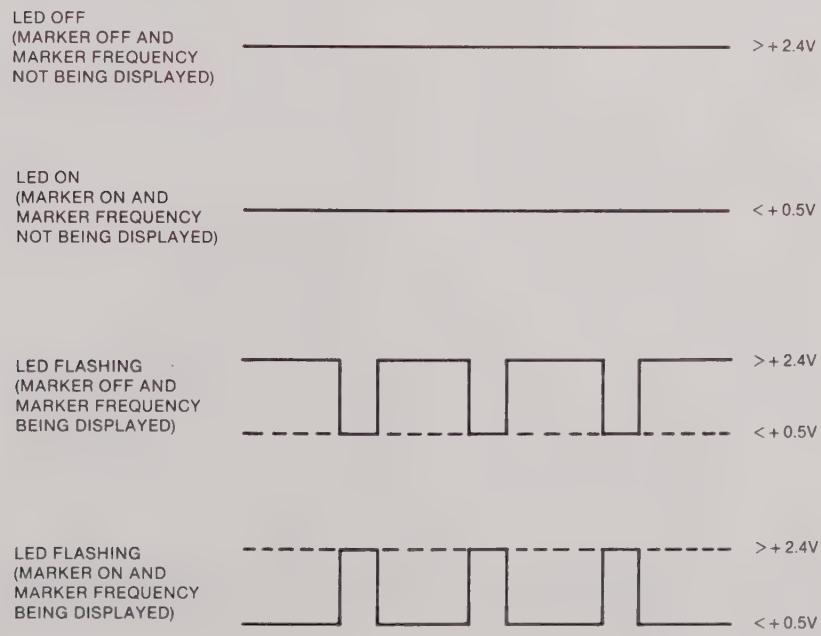


Figure 6-6. Marker LED Timing*

*Measured at the cathodes of CR16, CR17, and CR18, conditions apply to all three LEDS.

Control/Pushbutton	Setting
Swp Time	As directed in table 6-12
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

Table 6-12. Constant Current Source

Test Point	Sweep Time: Full cw	Sweep Time: Full ccw (But not in the Ext Tune position)
U33C-11, U33D-14	+10 ±0.01V	+10 ± 0.01V
U32C-10 U32C-9	+0.1V +.1V, −.08V	+0.1V, +.1V, −.08V
U32C-8	−10.2 to −10.8V	+13 ±0.5V (~3mV < +13V supply)

6.5.4.2 Comparator

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.1.
Calibration Procedure: Table 5-2, step 17.

Set the controls as shown, and take the measurements as listed in table 6-13 and figure 6-7.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

Table 6-13. Comparator

Test Point	Voltage	Tolerance
U26-5	+10.0V	±0.2V
U26-4	+3.5V	±1V
U26-8	>11.0V	

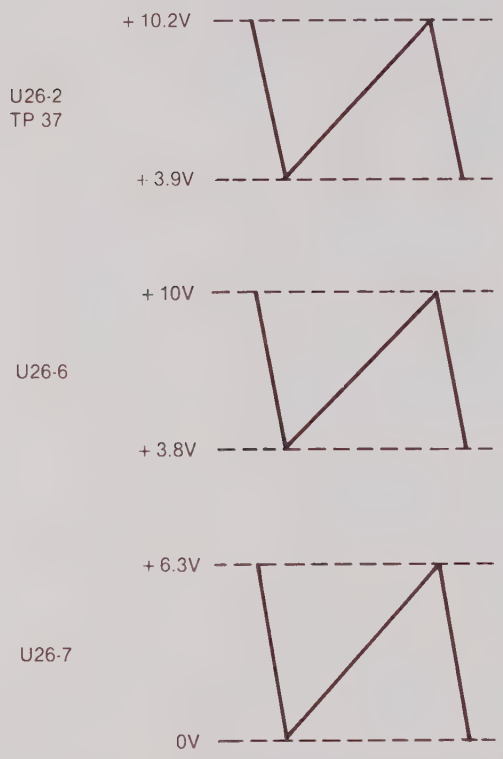


Figure 6-7. Comparator Waveforms

6.5.4.3 Sweep Shaper

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.1.
Calibration Procedure: Table 5-2, step 18.

Set the controls as shown, and measure the waveforms as shown in figure 6-8.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

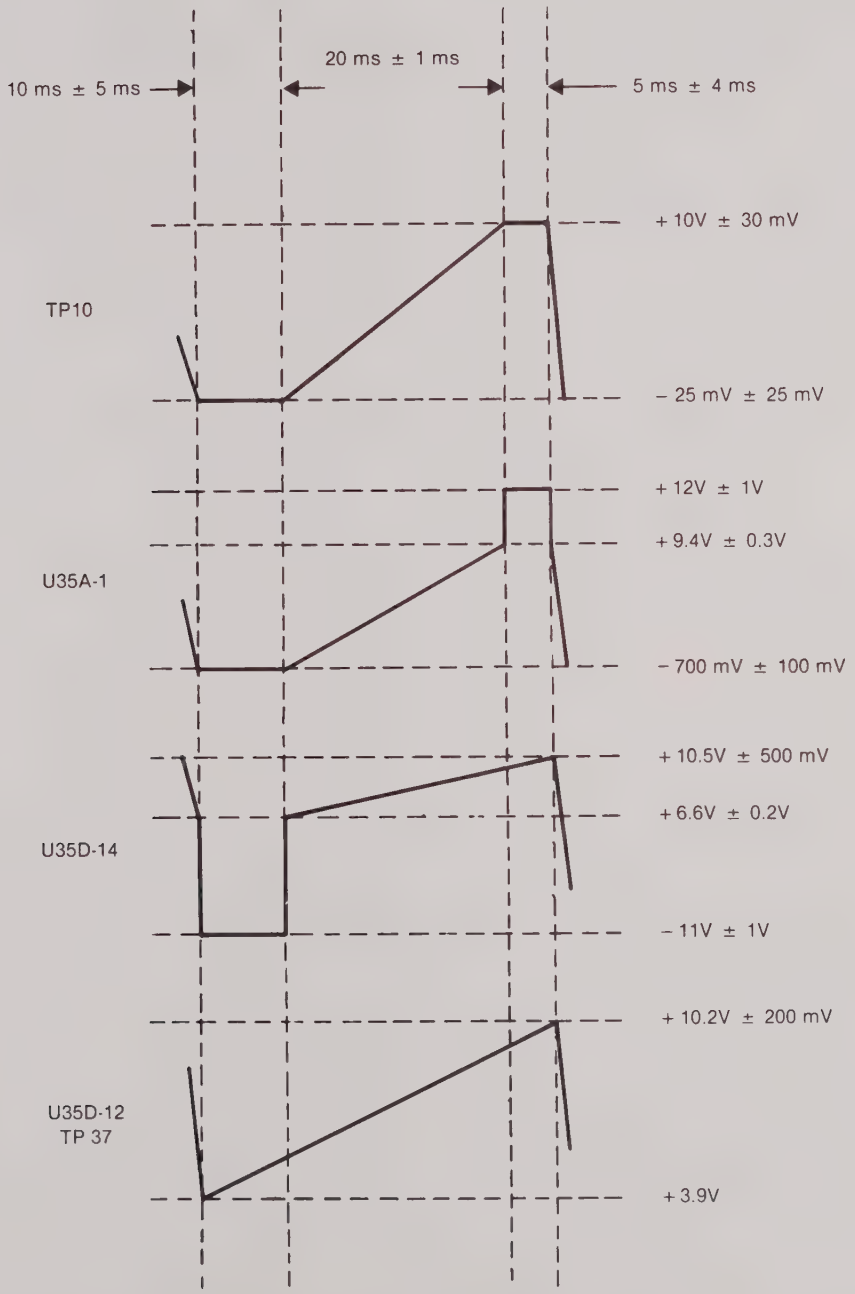


Figure 6-8. Shaper Waveforms

6.5.4.4 Top Flat Comparator

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.2.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as shown in figure 6-9.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

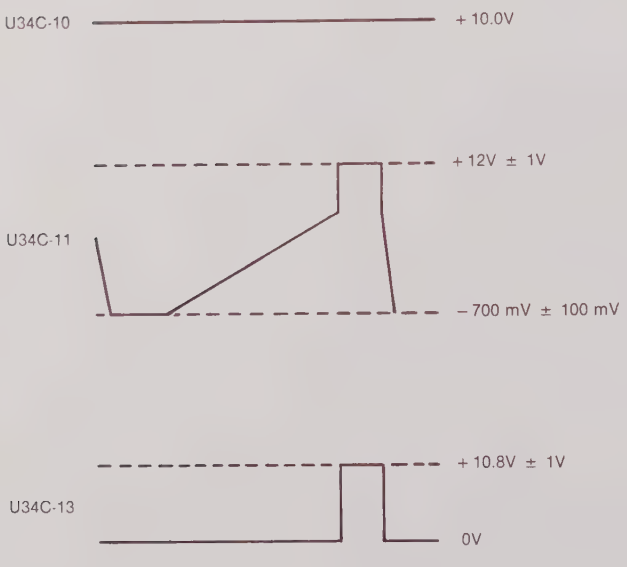


Figure 6-9. Top Flat Comparator Waveforms

6.5.4.5 Bottom Flat Comparator

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.2.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as shown in figure 6-10.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

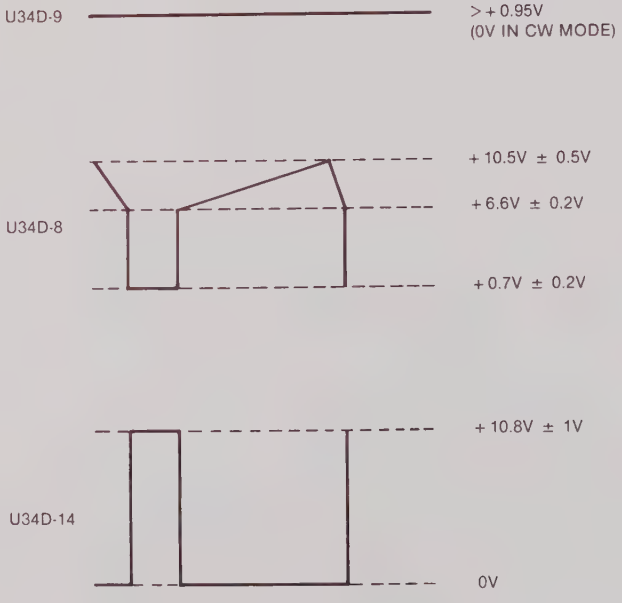


Figure 6-10. Bottom Flat Comparator

6.5.4.6 Monostable Retrace Comparator

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.2.
Calibration Procedure: None.

Set the controls as shown, and make the measurements as shown in figure 6-11.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

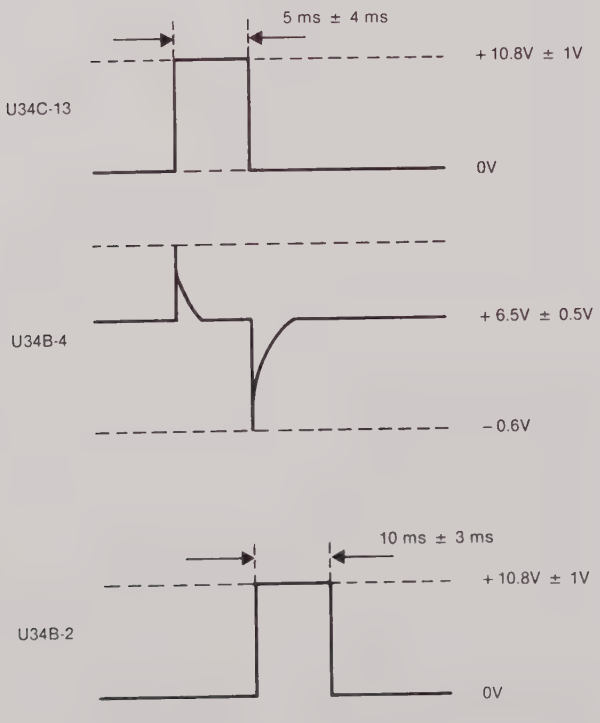


Figure 6-11. Monostable Retrace Comparator Waveforms

6.5.4.7 Summing Comparator

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.2.
Calibration Procedure: None.

Set the controls as shown, and make the measurements as shown in figure 6-12.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

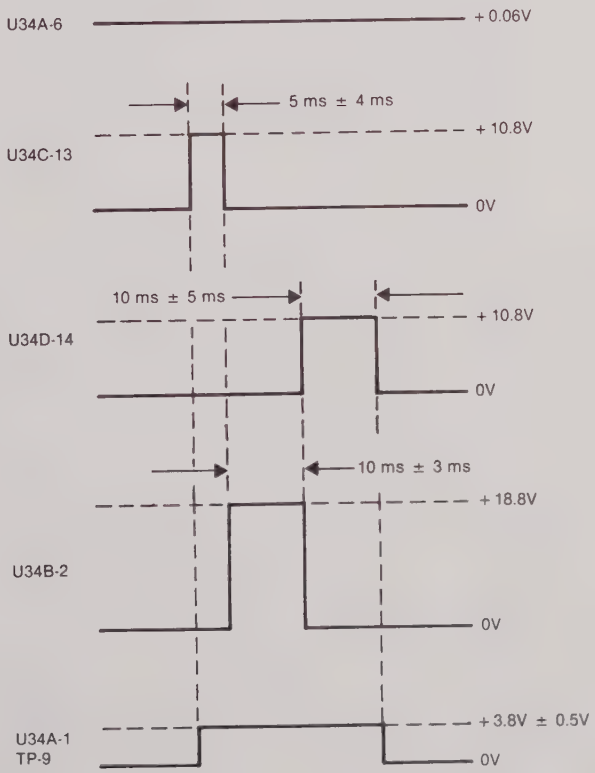


Figure 6-12. Summing Comparator Waveforms

6.5.4.8 Z-Axis Switching and Buffer

Related information in this manual.
Schematic: 0103-00-1875.
Circuit Description: Paragraph 4.2.4.2.
Calibration Procedure: Table 5-2, step 22.

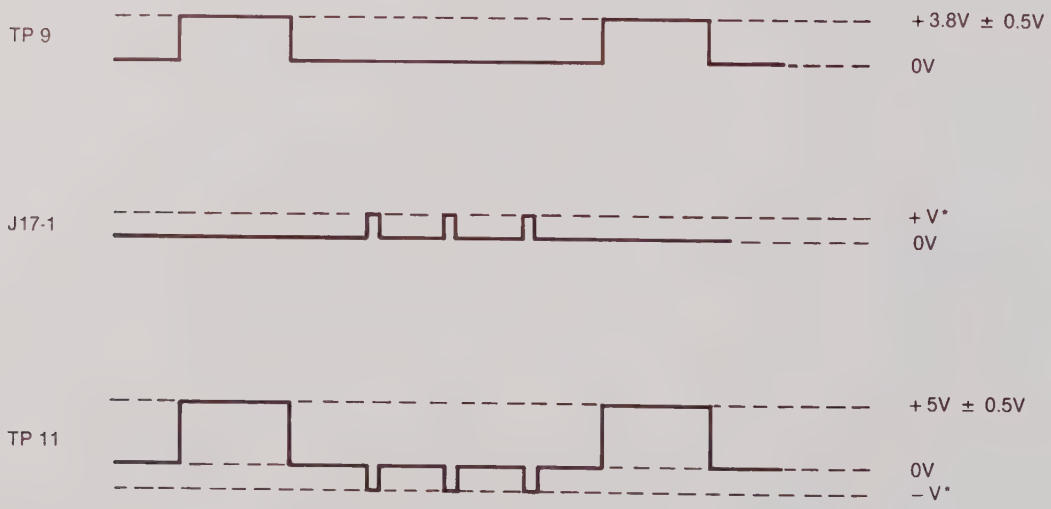
Set the controls as shown, and take the measurements as shown in figure 6-13. See table 6-14 for switch S1 settings.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All On, set markers at 1/3, 1/2, 2/3 band points
Mode	S/S Sweep
Ext Trig	Off (Autotrigger)
Ext Level	Off
RF On	Off

Table 6-14. Switch S1 Settings

Switch	Function
S1-2*	Closed selects negative going marker pulses.
S1-3	Closed selects positive going marker pulses.
S1-4	Closed selects negative going blanking pulses.
S1-5*	Closed selects positive going blanking pulses.

*Factory selected Z-Axis output.



*Voltage "V" set by Mkr Adj on the front panel.

Figure 6-13. Z-Axis Waveforms

Note: Switch S1 set as follows: S1-5 and S1-2 Closed, S1-4 and S1-3 Opened; Markers are turned on.

6.5.5 Frequency and Sweep Control

6.5.5.1 Frequency Control and Buffer

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.1.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as listed in table 6-15.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-15. Frequency Control and Buffer

Test Point	Voltage	Tolerance
U10-3	+10V	±20 mV
TP 12	+10V	±20 mV
Sweep Out Ext In BNC	+10V	±30 mV

6.5.5.2 Sweep Stop/ΔF

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraphs 4.2.5.2 and 4.2.5.3.
Calibration Procedure: Table 5-2, steps 31, 32, and 33.

Set the controls as shown, and take the measurements as shown in figure 6-14 and 6-15.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	As directed
Swp Time	Full cw
Markers	All Off
Mode	As directed
Ext Trig	Off
Ext Level	Off
RF On	On

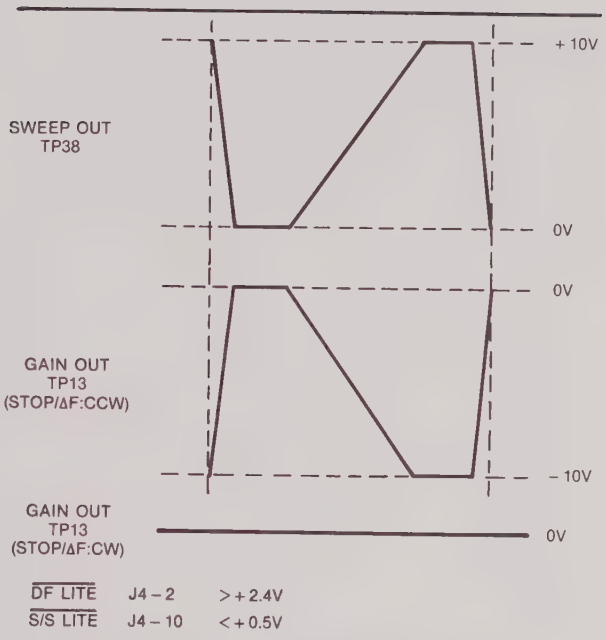


Figure 6-14. Stop Waveforms
Note: Set Mode to S/S Swp

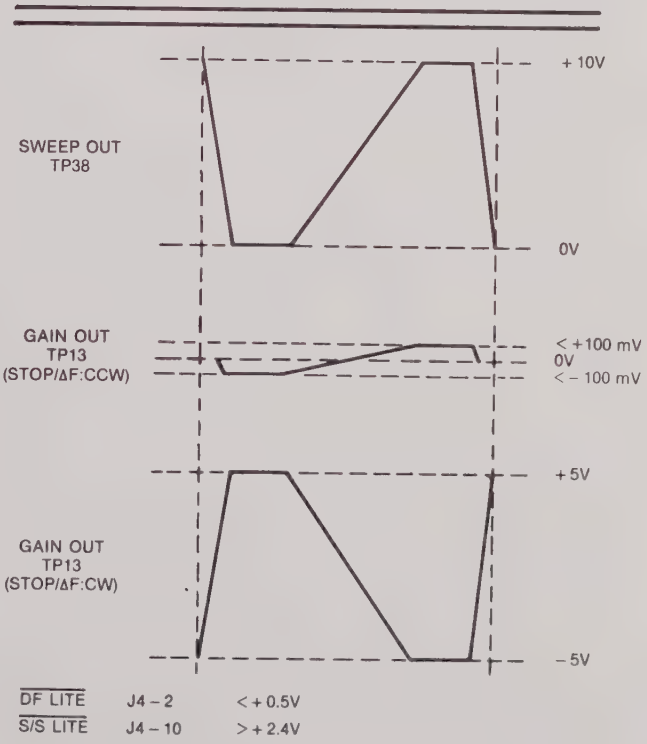


Figure 6-15. ΔF Waveforms
Note: Set Mode to ΔF Swp

6.5.5.3 Start

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.2.
Calibration Procedure: None.

Set the controls as shown, and make the measurements as shown in figure 6-16.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	As directed
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

6.5.5.4 CF Buffer

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.3.
Calibration Procedure: None.

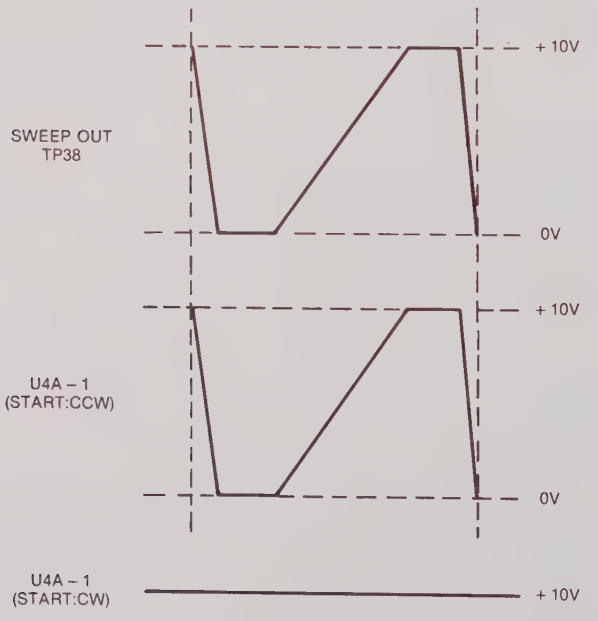


Figure 6-16. Start Waveforms

Set the controls as shown, and take the measurements as listed in table 6-16.

Control/Pushbutton	Setting
Main Tuning knob	As directed
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	ΔF Swp
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-16. Center Frequency

Test Point	Control/Setting	Voltage	Tolerance
BUF TUNE TP12	Main Tuning Knob: Full ccw	0.0V	±0.02V
U3A-1	Main Tuning Knob: Full ccw	0.0V	±0.02V
BUF TUNE TP 12	Main Tuning Knob: Full cw	+10.0V	±0.03V
U3A-1	Main Tuning Knob: Full cw	−10.0V	±0.15V

6.5.5.5 ΔF Clipper

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.3.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as shown in figure 6-17.

Control/Pushbutton	Setting
Main Tuning knob	As directed
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	As directed
Swp Time	Full cw
Markers	All Off
Mode	ΔF Swp
Ext Trig	Off
Ext Level	Off
RF On	On

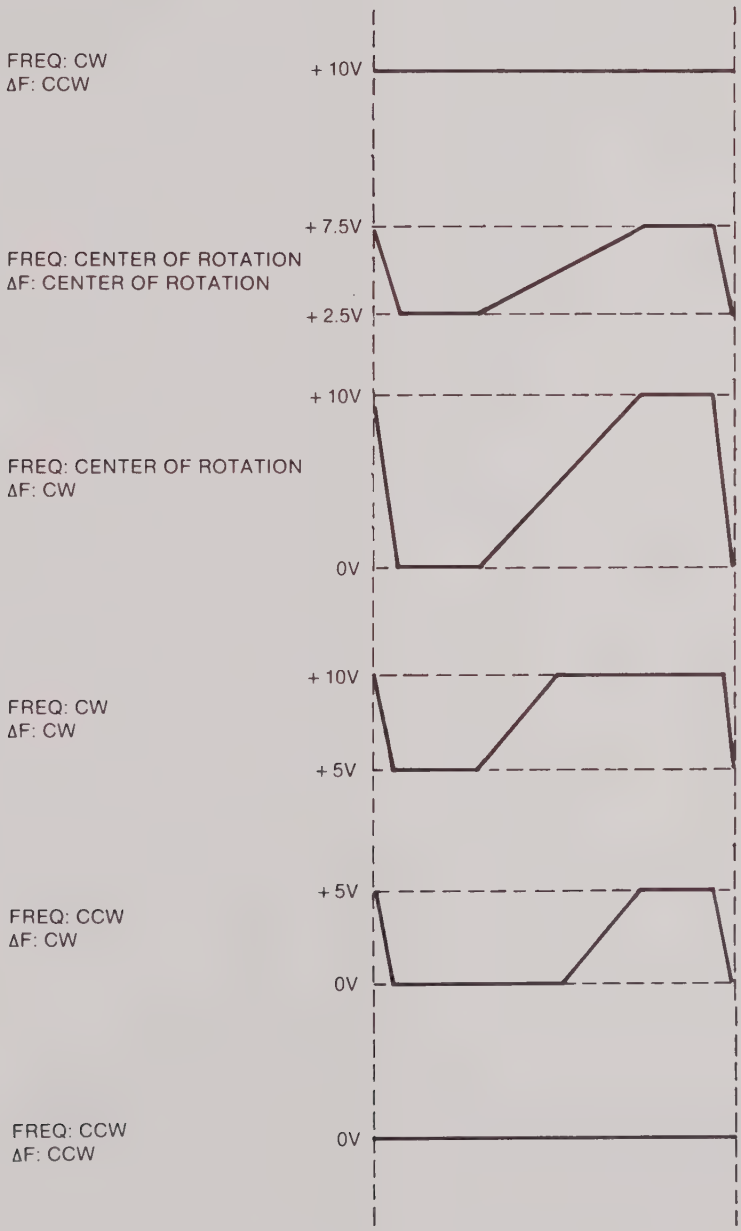


Figure 6-17. ΔF Waveforms At TP 15

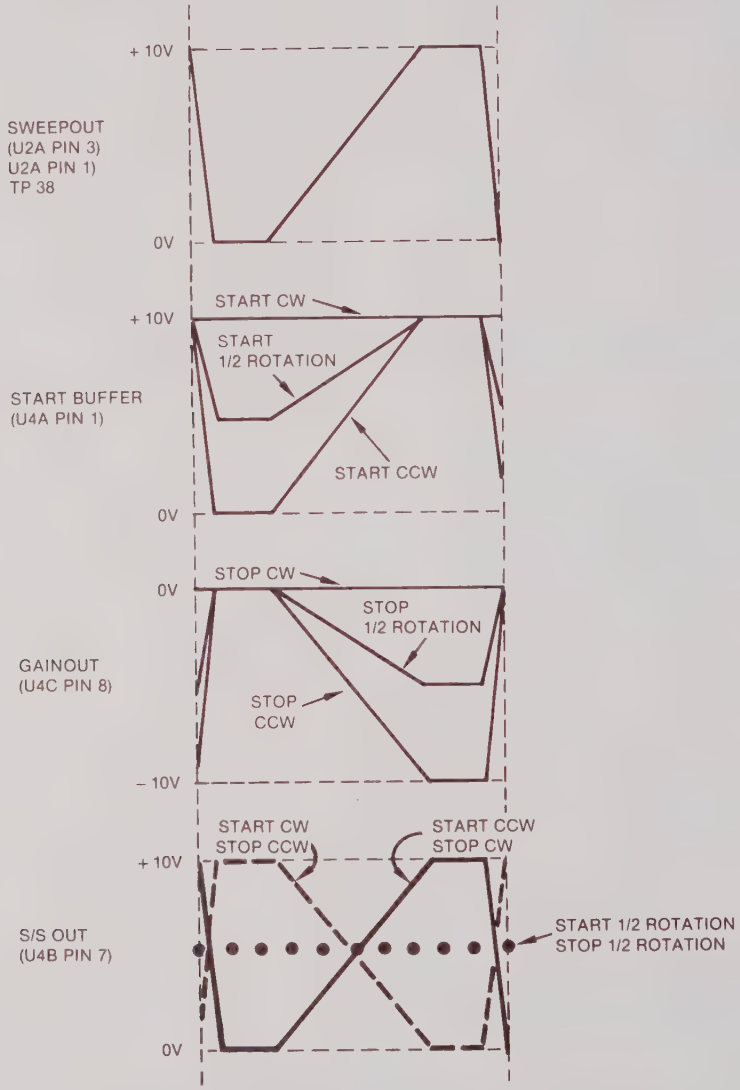


Figure 6-18. Start/Stop Sweep Buffer Waveforms

6.5.5.6 Start/Stop Sweep Buffer

Related information in this manual.
Schematic:0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.2.
Calibration Procedure: None.

Set the controls as shown, and take the measurments as shown in figure 6-18.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

6.5.5.7 Display Start/Stop Controls

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.5.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as listed in table 6-17.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	As directed
Stop/ΔF	As directed
Swp Time	Full cw
Markers	All Off
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-17. Start/Stop Frequency (Display)

Test Point	Control/Setting	Voltage	Tolerance
J16-2	Stop/ΔF: Full ccw	0.0V	±0.04V
J16-2	Stop/ΔF: Full cw	+10V	±0.04V
J16-8	Start/CF: Full ccw	0.0V	±0.04V
J16-8	Start/CF: Full cw	+10.0V	±0.04V

6.5.5.8 External Tune Switching

Related information in this manual.
Schematic: 0103-00-1848 Sheet 3.
Circuit Description: Paragraph 4.2.5.9.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as listed in tables 6-18 and 6-19.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full ccw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-18. External Tuning/Sweep Out (Mode: CW)

Test Point	Voltage
Sweep Out/ Ext Tune In	+10 ±0.02V
E10	+6.3 ±0.1V
J4-18 (EXTUNE)	+0.25 ±0.1V

Table 6-19. External Tuning/Sweep Out (External Tune)

NOTE: Set the Swp Time switch to Ext Tune; apply +5Vdc to the Sweep Out/Ext Tune In connector.

Test Point	Voltage
TP 12	+5V
E10	0.0V
J4-18 (EXTUNE)	>+2.0V

6.5.6 YIG Oscillator Control Block

6.5.6.1 Temperature Compensation

Related information in this manual.
Schematic: 0103-00-1848 Sheet 5.
Circuit Description: Paragraph 4.2.6.3.
Calibration Procedure: None (Factory Set).

Set the controls as shown, and take the measurements listed in table 6-20.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw

Control/Pushbutton	Setting
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	Off

Table 6-20. Temperature Compensation

Test Point	Voltage	Tolerance
TP 31	0.0V	± 0.5V
TP 30	0.0V	± 0.5V
U22A-3	+ 5.05V	± 0.25V
U22A-2	Within ± 10 mV of U22A-3 reading.	
U22B-5	+ 0.3V	± 50 mV
U22B-6	Within ± 10 mV of U22B-5 reading.	

6.5.6.2 YIG Tuning Coil Driver

Related information in this manual.
Schematic: 0103-00-1848 Sheet 5.
Circuit Description: Paragraph 4.2.6.2.
Calibration Procedure: None (Factory Set).

Set the controls as shown, and take the measurements as directed in table 6-21.

Control/Pushbutton	Setting
Main Tuning knob	As directed
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	Off

Table 6-21. YIG Main Tuning Coil Driver

	Model			
Test Point	962	964	965	967
TP 35 (Main Tuning full cw)	− 3.7 to − 4.8V	− 3.8 to − 4.5V	− 3.4 to − 3.9V	− 5.1 to − 5.6V
TP 35 (Main Tuning full ccw)	− 0.8 to − 1.2V	− 1.5 to − 1.9V	− 1.9 to − 2.2V	− 3.6 to − 4.7V
Q6 Base	1.5V (± 0.5V) more negative than voltage reading at TP 36.			
U24-6	5.0V (± 1.0V) more negative than voltage reading at TP 36.			
U24-3	0.0V ± 5mV	0.0V ± 5mV	0.0V ± 5mV	0.0V ± 5mV
TP 28	0.0V ± 5mV	0.0V ± 5mV	0.0V ± 5mV	0.0V ± 5mV

6.5.6.3 Oscillator Bias Supply

Related information in this manual.
Schematic: 0103-00-1848.
Circuit Description: Paragraph 4.2.6.1.
Calibration Procedure: None (Factory Set).

Set the controls as shown, and make the checks as shown in table 6-22.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-22. Oscillator Bias Supply (RF On)

Test Point	Voltage	Tolerance
VR3-3	+16.2V	±0.5V
VR3-2	+13.0V	±200 mV
VR3-1	1.25V (±50 mV) less than VR3-2	

Turn the RF ON off (indicator extinguished), and make the measurements as indicated in table 6-23.

Table 6-23. Oscillator Bias Supply (RF Off)

Test Point	Voltage	Tolerance
VR3-3	+16.2V	±0.5V
VR3-2	+1.3V	±1.3V
VR3-1	0.0V	±0.02V

6.5.7. YIG Oscillator

Related information in this manual.
Schematic: None.
Circuit Description: Paragraph 4.2.7.
Calibration Procedure: None (Factory Set).

NOTE

The YIG oscillator assembly is not a field repairable assembly. If it is defective, return the Micro Sweep to Wavetek Customer Service Department or an authorized service center for repair or calibration.

6.5.8 Modulation and Leveling

6.5.8.1 RF and AM Input Summing Amplifier

Related information in this manual.
Schematic: 0103-00-1848 Sheet 4.
Circuit Description: Paragraph 4.2.9.1.
Calibration Procedure: Table 5-2, step 68.

Set the controls as shown, and make the measurements listed in table 6-24.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	As directed in table 6-24
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
AM In	No input
Ext Level	Off
RF On	Off

Table 6-24. RF Level and AM In Amplifier

Test Point	RF Level Control	
	Full cw	Full ccw
J5-3	+4.0 ±1.0V	0.0 ±50mV
U25D-13	0.0 ±0.02V	0.0 ±0.02V
TP 23 (Model 962 only)	0.0 ±0.05V (0.0 ±0.05V)	+1.5 ±1.0V (−1.5 ±1.0V)

6.5.8.2 PIN Diode Attenuator Driver

Related information in this manual.
Schematic: 0103-00-1848.
Circuit Description: Paragraph 4.2.9.2.
Calibration Procedure: None.

Set the controls as shown, and take the measurements as listed in table 6-25.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	As directed in table 6-25
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	Off

Table 6-25. PIN Diode Attenuator Driver

Test Point	RF Level Control	
	Full cw	Full ccw
TP 23 (Model 962 only)	0.0 ±0.05V 0.0 ± 0.05V	+1.5 ±1.0V −1.5 ± 1.0V
TP 25 (Model 962 only)	0.0 ±0.2V (0.0 ±0.2V)	−0.75 ±0.1V (+0.75 ±0.1)
U19-5 (Model 962 only)	0.0 ±0.2V (0.0 ±0.2V)	−3.0 ±1.0V (+3.0 ±1.0V)

6.5.8.3 Automatic Level Control

Related information in this manual.
Schematic: 0103-00-1848 Sheet 4.
Circuit Description: Paragraph 4.2.9.3.
Calibration Procedure: Table 5-2, steps 64, 65, and 71.

Set the controls as shown, and make the measurements listed in table 6-26.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
ALC In	No input
RF On	Off

Table 6-26. Static RF Leveling

Test Point	Voltage	Tolerance
U5-4,6,8	0.0V	±50mV
TP 24	0.0V	±20mV
U25B-7	−11.0V	±1V
U5-2,5,3	−0.7V	±100mV
TP 23	0.0V	±50mV

Set the Micro Sweep for external leveling (refer to paragraph 3.2.6), connect the ALC In to a precision −100mV source, and make the measurements as listed in table 6-27.

Table 6-27. Frequency Control and Buffer (Operating)

Test Point	Voltage	Tolerance
TP 24	−11.24V	±1.0V
U25B-7	+10.0V	±1.5V
U5-2, 5, 3	+6.0V	±2.0V

6.5.8.4 FM Coil Drive

Related information in this manual.
Schematic: 0103-00-1848 Sheet 4.
Circuit Description: Paragraph 4.2.9.4.
Calibration Procedure: None.

Set the controls as shown, and make the measurements listed in figure 6-19.

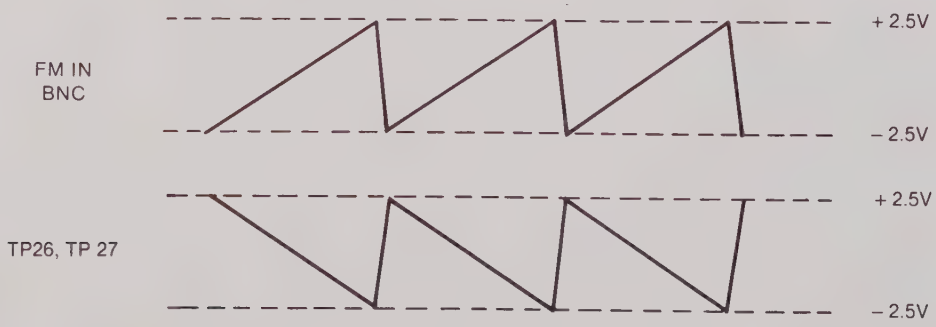


Figure 6-19. FM Coil Drive

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On
FM In BNC	Connector to ±2.5 5kHz sawtooth wave generator; see figure 6-19.

6.5.9 Marker Control Block

6.5.9.1 Marker A to D and D to A Conversion

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraphs 4.2.8.1 and 4.2.8.2.
Calibration Procedure: Table 5-2, steps 49 and 54.

Set the controls as shown, and take the measurements as shown in figure 6-20. The information shown in figure 6-20 is for updating marker 3. The information is similar for markers 2 and 1, except the respective markers pushbuttons must be pressed.

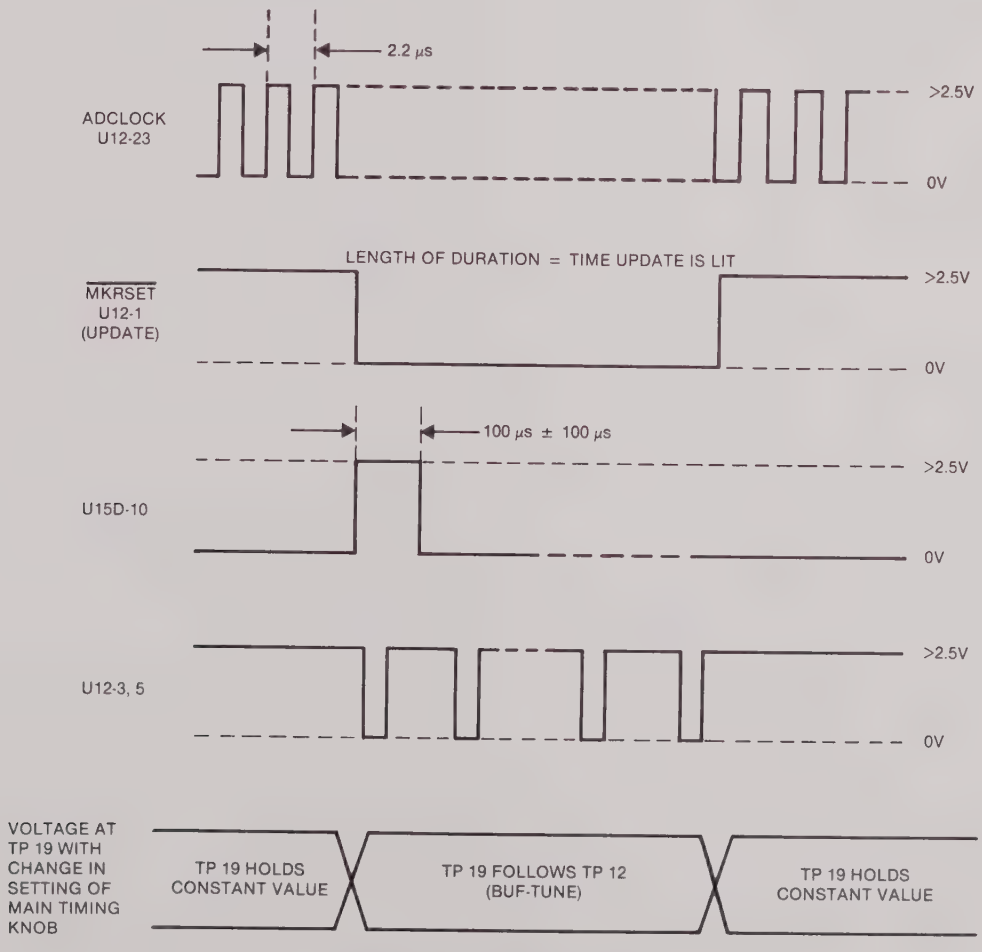


Figure 6-20. Marker Control

NOTE: Times given may vary by up to 20% from nominal values.

Control/Pushbutton	Setting
Main Tuning knob	Various
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
M3	Selected (LED blinking)
Update	Off
On/Off	Off
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

6.5.9.2 Marker Enable Decoder

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraph 4.2.8.1.
Calibration Procedure: None.

Set the controls as shown, and refer to table 6-28.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
M1, M2, M3	As directed
Update	Off
On/Off	Off
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-28. Marker Decoder

1 = >+2.5V 0 = <+0.8V

Control Line	Pushbutton	U28 12	U28 13	U28 14
$\overline{M1}$	Push M1	1	1	0
$\overline{M2}$	Push M2	1	0	1
$\overline{M3}$	Push M3	0	1	1

6.5.9.3 Marker Sweep Comparator

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraph 4.2.8.3.
Calibration Procedure: None.

Set the controls as shown; then refer to figure 6-21.

Control/Pushbutton	Setting
Main Tuning knob	Center of frequency band
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
M1, M2, M3	*
Update	*
On/Off	*
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

*Set all three markers to the center of the frequency band by pressing the marker pushbutton, followed by the On/Off to On, and then the Update pushbutton.

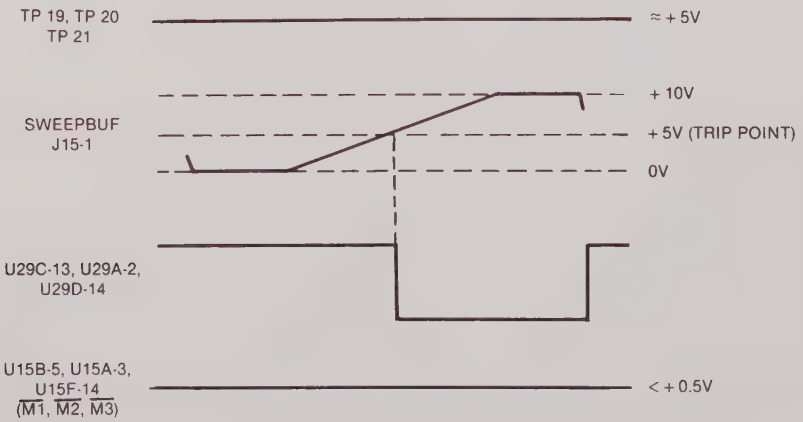


Figure 6-21 Output Comparator

6.5.9.4 Transition Detector

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraph 4.2.8.4.
Calibration Procedure: Table 5-2, step 63.

Set the controls as shown; then refer to figure 6-22.

Control/Pushbutton	Setting
Main Tuning knob	Center of frequency band
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
M1, M2	Off
M3	On
Update	*
On/Off	*
Mode	S/S Swp
Ext Trig	Off
Ext Level	Off
RF On	On

*Set marker M3 to the center of the frequency band by pressing the marker 3 pushbutton, followed by the On/Off to On, and then the Update pushbutton.

6.5.10 Display Block

6.5.10.1 Voltmeter and Display

Related information in this manual.
Schematic: 0103-00-1851.
Circuit Description: Paragraph 4.2.10.3.
Calibration Procedure: None.

Set the controls as shown below, and take the measurements in table 6-29 (callouts are as viewed from the rear of the instrument looking forward) and figure 6-23.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

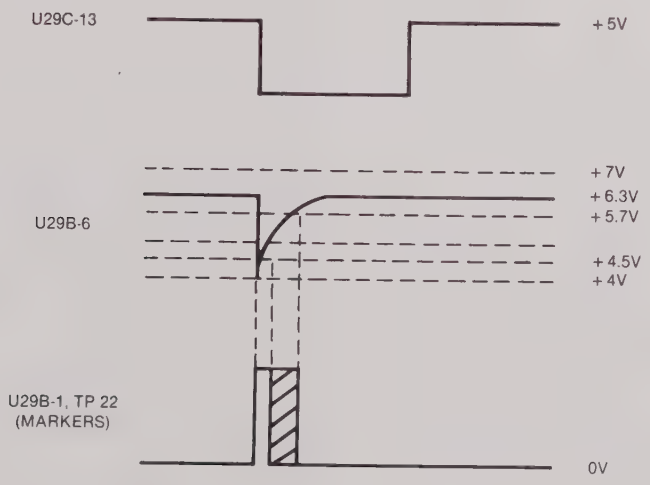


Figure 6-22. Marker Output

NOTE: Marker pulse width proportional to setting of reference level R213.

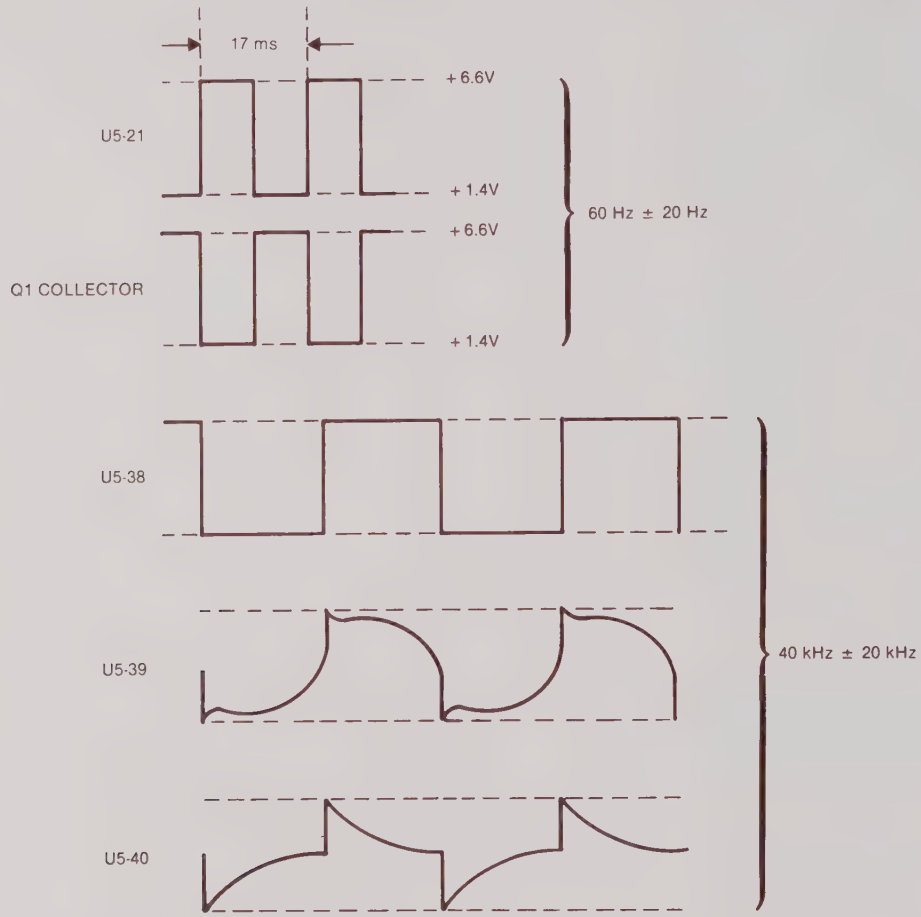


Figure 6-23. Frequency Display Waveforms

Table 6-29. Voltmeter and Display

Test Point	Voltage	Tolerance
J20A-7	−13.0V	±0.5V
J20B-6	+13.0V	±0.5V
CR2 Cathode	−6.6V	±0.5V
Q1 Emitter	+6.6V	±0.5V
Q1 Base	+6.3V	±0.25V
U5-31 (HI INPUT)	+2.95V	±50 mV
U5-30 (LO INPUT)	+2.5V	±1.0V
U5-36 (HI REF)	+1.25V	±0.75V

Rotate the Main Tuning control so that the LCD display shows each number in the frequency range. Check that each segment of each digit is energized throughout the entire frequency range. The frequency range for all Micro Sweep models is given in table 6-30.

Table 6-30. LCD Display

Model	Frequency Range For Segments
962	0.95 to 4.05 GHz
964	3.65 to 8.45 GHz
965	6.95 to 12.45 GHz
967	11.95 to 18.05 GHz

6.5.10.2 Offset and Scaling Network

Related information in this manual.
Schematic:0103-00-1857 Sheet 2.
Circuit Description: Paragraph 4.2.10.2.
Calibration Procedure: Table 5-2, steps 9, 10, and 11.

Set the controls as shown, and make the measurements as listed in table 6-31.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	All Off
Mode	CW
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-31. Display Input Offset and Scaling Network

Test Point	Voltage	Tolerance
J4-22 (DISPLAY)	+3.45V	±0.100V
J4-23 (+10V REF)	+10V	±1mV

6.5.10.3 Display Multiplexer

Related information in this manual.
Schematic: 0103-00-1854.
Circuit Description: Paragraph 4.2.10.1.
Calibration Procedure: Table 5-2, steps 13 and 14.

Set the controls as directed (the condition being checked depends upon the pushbuttons pushed), and check the circuit against the logic in table 6-32. Also, measure the voltages listed in table 6-33.

Control/Pushbutton	Setting
Main Tuning knob	Full cw
Power	On
RF Level	Full cw
Start	Full ccw
Stop/ΔF	Full cw
Swp Time	Full cw
Markers	On as needed and set to top of band
Mode	As needed
Display Start/CF	On as needed
Display Stop/ΔF	On as needed
Ext Trig	Off
Ext Level	Off
RF On	On

Table 6-32. Display Multiplexer Logic

LCD Display	DM3 U13-15	DM2 U13-16	DM1 U13-1
Δ Frequency	0	0	0
Marker 1	0	0	1
Marker 2	0	1	0
Marker 3	0	1	1
Stop Frequency	1	0	0
Start Frequency	1	0	1
Center Frequency	1	1	0
CW Frequency	1	1	1

Table 6-33. Display Multiplexer Inputs

Function	Test Point	Voltage	Tolerance
Marker 1	U13-5 (S2)	*	
Marker 2	U13-6 (S3)	*	
Marker 3	U13-7 (S4)	*	
Stop Frequency	U13-12 (S5)	+10V	±0.03V
Start Frequency	U13-11 (S6)	0V	±0.01V
Center Frequency	U13-10 (S7)	+10V	±0.03V
CW Frequency	U13-9 (S8)	+10V	±0.02V

*To set up the three markers, refer to paragraph 3.2.5 of this manual. The marker inputs (S2, S3, S4) will be +10V ±50mV if the marker frequencies are updated with the main tuning knob at full cw.

6.6 TROUBLESHOOTING INDIVIDUAL COMPONENTS

6.6.1 Transistors

1. A transistor is defective if more than 1V is measured across the base-emitter junction in the forward direction.
2. A transistor, when used as a switch may have a few volts reverse bias across the base-emitter junction.

3. If the collector and emitter voltages are the same, but the base-emitter voltage is less than 500mV forward voltage (or reversed bias), the transistor is defective.
4. A transistor is defective if the base current is larger than 10% of the emitter current (calculate currents from the voltage drop across the base and emitter series resistors).
5. In a differential pair of transistors (common emitter stages), either their base voltages are the same in normal operating conditions, or the one with less forward voltage across the base-emitter junction should be off (no collector current), otherwise, one of the transistors is defective.

6.6.2 Diodes

A diode (except a zener) is defective if there is greater than 1V (typically 0.7V) forward voltage across it.

6.6.3 Operational Amplifiers

1. The "+" and "−" inputs of an operational amplifier will have less than 15mV difference when operating under normal conditions.
2. When the output of the amplifier is connected to the "−" input (voltage follower connection), the output should be the same voltage as the "+" input voltage, otherwise, the operational amplifier is defective.
3. If the output voltage stays at maximum positive, the "+" input voltage should be more positive than the "−" input voltage, or vice versa, otherwise, the operational amplifier is defective.

6.6.4 FET Transistor

1. No gate current should be drawn by the gate of an FET transistor. If so, the transistor is defective.
2. The gate-to-source voltage is always reverse biased under normal operating conditions; e.g., the source voltage is more positive than the gate voltage for an 2N5485, and the source voltage is more negative than the gate voltage for a 2N5462. Otherwise, the FET is defective.
3. If the device supplying the gate voltage to a FET saturated, the FET has too large a V_{gs} (pinch off) for the circuit and should be replaced.

6.6.5 Capacitors

1. Shorted capacitors have 0.0Vdc across their terminals.
2. Open capacitors can be located (but not always) by connecting a good capacitor in parallel with the capacitor under test and observing the resulting effect.
3. Leaky capacitors will often have a decreased voltage across their terminals.

6.6.6 Digital TTL Integrated Circuits (e.g. 7400 series)

1. The device is operating correctly if the output high state is $>+2.4$V and the low state is $<+0.5$V.
2. The input must show the same two levels as in step 1. If the levels are between +0.8V and +2.0V, the connection to the driving circuit output is open.

6.6.7 Reed Relays

1. The closed contacts of a good reed relay will have less than 100mΩ of resistance.
2. Reed relay contact current is limited to 50mA or less. With 50mA of current, a good contact will produce a voltage of less than 5mV. A higher voltage reading indicates an open or defective relay contact.

6.6.8 Light Emitting Diodes (LED)

1. A typical light emitting diode (LED) will glow with a voltage of 1.2 to 2.0V applied as forward bias.
2. Most LEDs are operated with a current/voltage limiting resistor in series with the LED. The resistor can be checked by subtracting the normal LED voltage from the source voltage and comparing the result with the voltage drop across the resistor.

SECTION 7
PARTS LISTS AND SCHEMATICS

7.1 DRAWINGS

The following assembly drawings with parts list and schematics are in the arrangement shown below.

7.2 ADDENDA

Under Wavetek's product improvement program, the latest electronic designs and circuits are incorporated into each Wavetek instrument as quickly as development and testing permit. Because of the time needed to compose and print instruction manuals, it is not always possible to include the most recent changes in the initial printing. Whenever this occurs, addendum pages are prepared to summarize the changes made and are inserted immediately inside the rear cover. If no such pages exist, the manual is correct as printed.

7.3 ORDERING PARTS

When ordering spare parts, please specify part number, circuit reference, board, serial number of the unit, and, if applicable, the function performed.

DRAWING	DRAWING NUMBER
Instrument Outline Drawing*	0009-00-0422
Instrument Schematic*	0004-00-0422
Chassis Assembly Drawing*	0002-00-0422
962 Chassis Parts List	1101-00-2381
964 Chassis Parts List	1101-00-2382
965 Chassis Parts List	1101-00-2383
967 Chassis Parts List	1101-00-2384
962 Oscillator/Rear Panel Schematic	0103-00-2243
962 Rear Panel Assembly	0102-00-2233
962 Rear Panel Parts List	1101-00-2233
964 Oscillator/Rear Panel Schematic	0103-00-2244
964 Rear Panel Assembly	0102-00-2234
964 Rear Panel Parts List	1101-00-2234
965/967 Oscillator/Rear Panel Schematic	0103-00-2245
965 Rear Panel Assembly	0102-00-2235
965 Rear Panel Parts List	1101-00-2235
967 Rear Panel Assembly	0102-00-2236
967 Rear Panel Parts List	1101-00-2236
Rear Panel Assembly*	0102-00-2242
Rear Panel Parts List*	1206-00-2242
Front Panel Assembly*	0102-00-2209
Front Panel Parts List*	1101-00-2209

*960 Series Schematic, Assembly, or Parts List.

DRAWING	DRAWING NUMBER
Display Board Schematic*	0103-00-1851
Display Board Assembly*	0101-00-1851
Display Board Parts List*	1208-00-1851
Digital Board Schematic*	0103-00-1857
Digital Board Assembly*	0101-00-1857
Digital Board Parts List*	1208-00-1857
Main Board Schematic*	0103-00-1848
Main Board Assembly*	0101-00-1848
962 Main Board Assembly	0101-00-2222
964 Main Board Assembly	0101-00-1890
965 Main Board Assembly	0101-00-1893
967 Main Board Assembly	0101-00-1896
Main Board Parts List*	1208-00-1848
962 Main Board Parts List	1100-00-2222
964 Main Board Parts List	1100-00-1890
965 Main Board Parts List	1100-00-1893
967 Main Board Parts List	1100-00-1896
Marker Board Schematic*	0103-00-1854
Marker Board Assembly*	0101-00-1854
Marker Board Parts List*	1100-00-2220
Marker Board Parts List*	1208-00-1854
Waveform Generator Board Schematic*	0103-00-1875
Waveform Generator Board Assembly*	0101-00-1875
Waveform Generator Board Parts List*	1100-00-2221
Waveform Generator Board Parts List*	1208-00-1875
Power Supply Assembly*	0102-00-1178
Power Supply Parts List*	1101-00-1178
964 RF String Assembly	0102-00-2226
964 RF String Parts List	1101-00-2226
965 RF String Assembly	0102-00-2227
965 RF String Parts List	1101-00-2227
967 RF String Assembly	0102-00-2228
967 RF String Parts List	1101-00-2228

*960 Series Schematic, Assembly, or Parts List.

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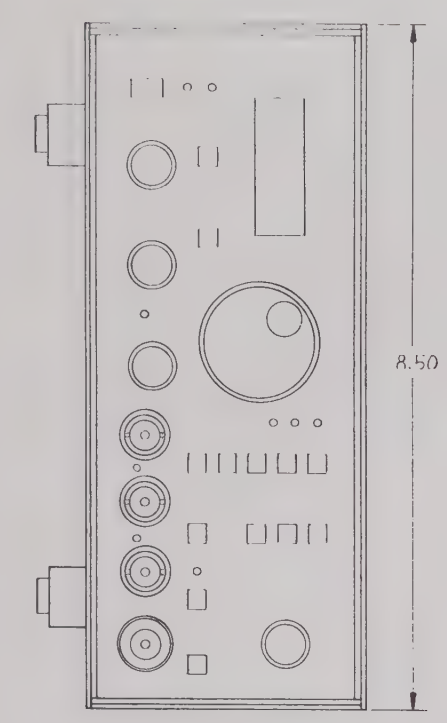
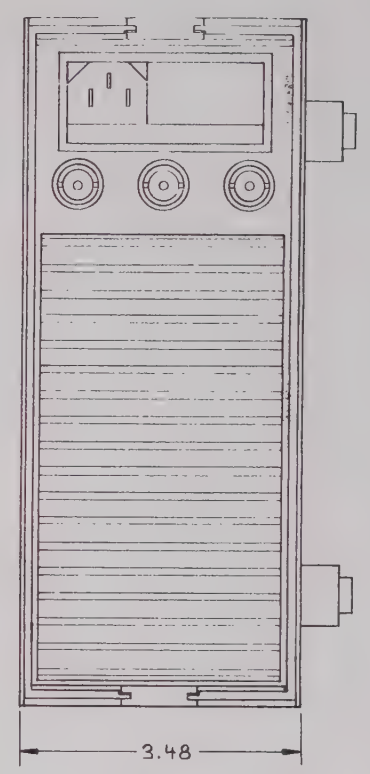
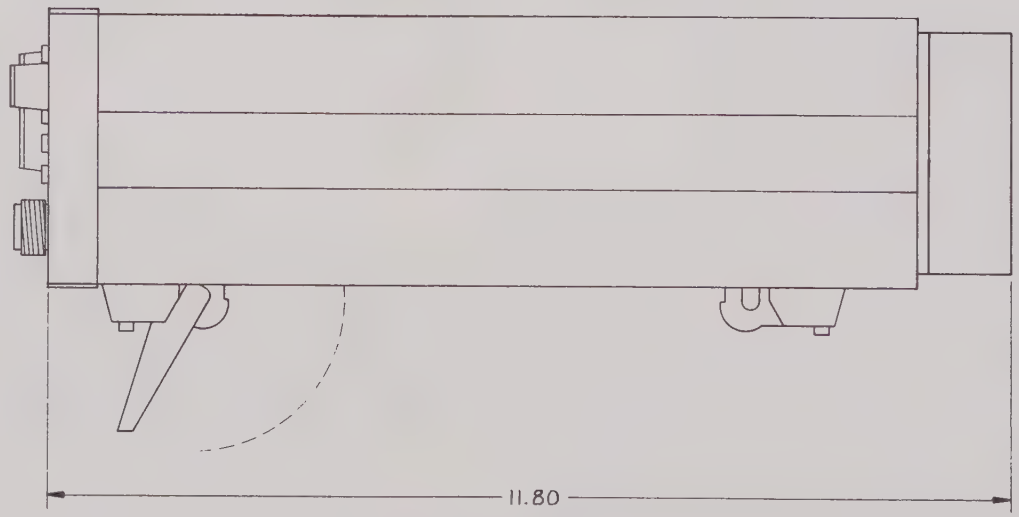
REV	ECN	BY	DATE	APP







NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 5/22/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR [illegible]	11/85	TITLE
	APPROVED [illegible]	7/2/85	OUTLINE DRAWING
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ±1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 960 SERIES / DWG NO 0179 00-0422 / REV A
	SCALE NONE		CODE IDENT 23338 / SHEET / OF

BISHOP GRAPHICS, INC. REORDER NO. A3798

MODEL 960 SERIES
INSTRUMENT SCHEMATIC

REV	ECN	BY	DATE	APPV
A	RELEASED	AS	7-93	AS

MODEL NO.	960 SERIES
DRAWING NUMBER	0004-00-0422
CODE IDENT	23338
SHEET	1 OF 1
REV	A

DRAWN BY C. KREHBIEL — DATE 3/27/85
PROJ ENGR — DATE 7/85
APPROVED — RELEASE NUMBER — DATE 7/25/85
TITLE

Wavetek SAN DIEGO, CALIFORNIA

DISPLAY BOARD

J20A — P20B
J20B — P20A

1	DF_LITE	DF_LITE	1
2	CW_LITE	CW_LITE	2
3	MKRSET	MKRSET	3
4	45_KHZ	45_KHZ	4
5	VCC	VCC	5
6	GND	GND	6
7	-13V	-13V	7
8	OSC_+5V	OSC_+5V	8
1	REF_HI	REF_HI	1
2	REF_LO	REF_LO	2
3	COM	COM	3
4	INP_HI	INP_HI	4
5	INP_LO	INP_LO	5
6	+13V	+13V	6
7	SWEEP	SWEEP	7
8	SWEEP	SWEEP	8

DIGITAL CIRCUIT BOARD

J4 — P4

1	SWEEP	SWEEP	1
2	DF_LITE	DF_LITE	2
3	CW_LITE	CW_LITE	3
4	MKRSET	MKRSET	4
5	RF_LITE	RF_LITE	5
6	LEV	LEV	6
7	+13V	+13V	7
8	GND1	GND1	8
9	-13V	-13V	9
10	S/SLITE	S/SLITE	10
11	DM3	DM3	11
12	DM2	DM2	12
13	DM1	DM1	13
14	M3	M3	14
15	M2	M2	15
16	M1	M1	16
17	LEVINDIC	LEVINDIC	17
18	EXTUNE	EXTUNE	18
19			19
20	EXTT	EXTT	20
21	GND2	GND2	21
22	DISPLAY	DISPLAY	22
23	+10V_REF	+10V_REF	23
24	+6.3V	+6.3V	24
25			25
26	VCC_BATT	VCC_BATT	26

MAIN CIRCUIT BOARD

FRONT PANEL

P19	1	BATTERY+	BATTERY+	1	P19
	2	BATTERY-	BATTERY-	2	
P14	1	TRIG	TRIGGER	1	P14
	2	GND1	GND1	2	
P2	1	GND2	GND2	1	P2
	2	FREQ CONTROL	FREQ CONTROL	2	
	3	+10V_REF	+10V_REF	3	
P5	1	LGND	LGND	1	P5
	2	LEVEL CONTROL	LEVEL CONTROL	2	
	3	LEVEL REF	LEVEL REF	3	
P11	1	LGND	LGND	1	P11
	2	AM RETURN	AM RETURN	2	
	3	AM INPUT	AM INPUT	3	
P7	1	LGND	LGND	1	P7
	2	ALC RETURN	ALC RETURN	2	
	3	ALC INPUT	ALC INPUT	3	

OPTIONAL BATTERY BACKUP — TRIG IN BNC — FREQ CONTROL POT — LEVEL CONTROL POT — AM INPUT BNC — ALC INPUT BNC

REAR PANEL ASSY

P12	1	-15V	-15V	1	P1
	2	-15V	-15V	2	
	3	OSC DRIVE BASE	OSC DRIVE BASE	3	
	4	-13V REG CONTROL	-13V REG CONTROL	4	
	5	-13V OUT	-13V OUT	5	
	6	+13 REG CONTROL	+13 REG CONTROL	6	
	7	+13V OUT	+13V OUT	7	
	8	+16V	+16V	8	
	9	GUNN DRIVE E.	GUNN DRIVE E.	9	
	10	GUNN DRIVE B	GUNN DRIVE B	10	

YIG OSCILLATOR ASSY

P1	1	MAIN COIL +	MAIN COIL +	1	P1
	2	MAIN COIL -	MAIN COIL -	2	
	3	FM COIL -	FM COIL -	3	
	4	FM COIL +	FM COIL +	4	
	5	BIAS +	BIAS +	5	
	6	HEATER	HEATER	6	
	7	HEATER	HEATER	7	
	8	OSCILLATOR GND	OSCILLATOR GND	8	
	9	BIAS RETURN	BIAS RETURN	9	
	10	-6.3V/GUNN DIODE SUPPLY	-6.3V/GUNN DIODE SUPPLY	10	

REAR PANEL

P6	1	SIGNAL RETURN	SIGNAL RETURN	1	P6
	2			2	
	3			3	
P10	1	TEMP +	TEMP +	1	P10
	2	TEMP -	TEMP -	2	
	3	GND1	GND1	3	
P8	1	LGND	LGND	1	P8
	2	DIODE CURRENT	DIODE CURRENT	2	
	3			3	
P13	1	FM_INPUT	FM_INPUT	1	P13
	2	FM RETURN	FM RETURN	2	
	3			3	
P3	1	Z_AXIS	Z_AXIS	1	P3
	2	GND1	GND1	2	
	3			3	
P9	1	+16V CHSS_GND	+16V CHSS_GND	1	P9
	2	-16V	-16V	2	
	3			3	

INT LEVEL RETURN LGND — SIGNAL RETURN — TEMP + TEMP - GND1 — LGND DIODE CURRENT — FM_INPUT FM RETURN — Z_AXIS GND1 — +16V CHSS_GND -16V

INTERNAL LEVEL OPTION — SWP OUT, EXT TUNE INPUT BNC — OSC TEMP SENSOR — PIN DIODE DRIVE — FM INPUT BNC — Z_AXIS OUTPUT BNC — DC POWER SUPPLY

MARKER CIRCUIT BOARD

J15 — P15 — J16 — P16

J15	12	+13V	SWEEPBUF	12	P15
	11	GND1	-13V	11	
	10	+6.3V	GND2	10	
	9	BUF_TUNE	+6.3V	9	
	8	-13V	GND1	8	
	7	MARKERS	V+BAT	7	
	6	V+BAT	GND1	6	
	5	GND1	+6.3V	5	
	4	+6.3V	GND2	4	
	3	GND2	-13V	3	
	2	-13V	STOPFRQ	2	
	1	SWEEPBUF	+10_BUFF	1	
J16	12	MKRSET	MKRSET	12	P16
	11	M3	M3	11	
	10	DM2	DM2	10	
	9	STARTFRQ	STARTFRQ	9	
	8	DISPLAY	DISPLAY	8	
	7	-10V_REF	-10V_REF	7	
	6	M2	M2	6	
	5	DM1	DM1	5	
	4	DM3	DM3	4	
	3	STOPFRQ	STOPFRQ	3	
	2	+10_BUFF	+10_BUFF	2	
	1	STOPFRQ	STOPFRQ	1	

WAVEFORM CIRCUIT BOARD

J17 — P17 — J18 — P18

J17	12	+13V	+13V	12	P17
	11	GND1	SWEEPOUT	11	
	10	SWEEPOUT	GND1	10	
	9	GND2	-13V	9	
	8	-13V	GND2	8	
	7	Z_AXIS	Z_AXIS	7	
	6	+13V	GND1	6	
	5	GND1	+6.3V	5	
	4	GND2	GND2	4	
	3	+6.3V	-13V	3	
	2	-13V	MARKERS	2	
	1	MARKERS	+13V	1	
J18	12	+10_BUFF	+10_BUFF	12	P18
	11	SWEEP	SWEEP	11	
	10	+10_BUFF	RATE_CONTROL	10	
	9	RATE_CONTROL	CW_LITE	9	
	8	CW_LITE	TRIGGER	8	
	7	TRIGGER	EXTT	7	
	6	EXTT	+10_BUFF	6	
	5	+10_BUFF		5	
	4			4	
	3			3	
	2			2	
	1			1	

WAVEFORM CIRCUIT BOARD

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REV	ECN	BY	DATE	APP
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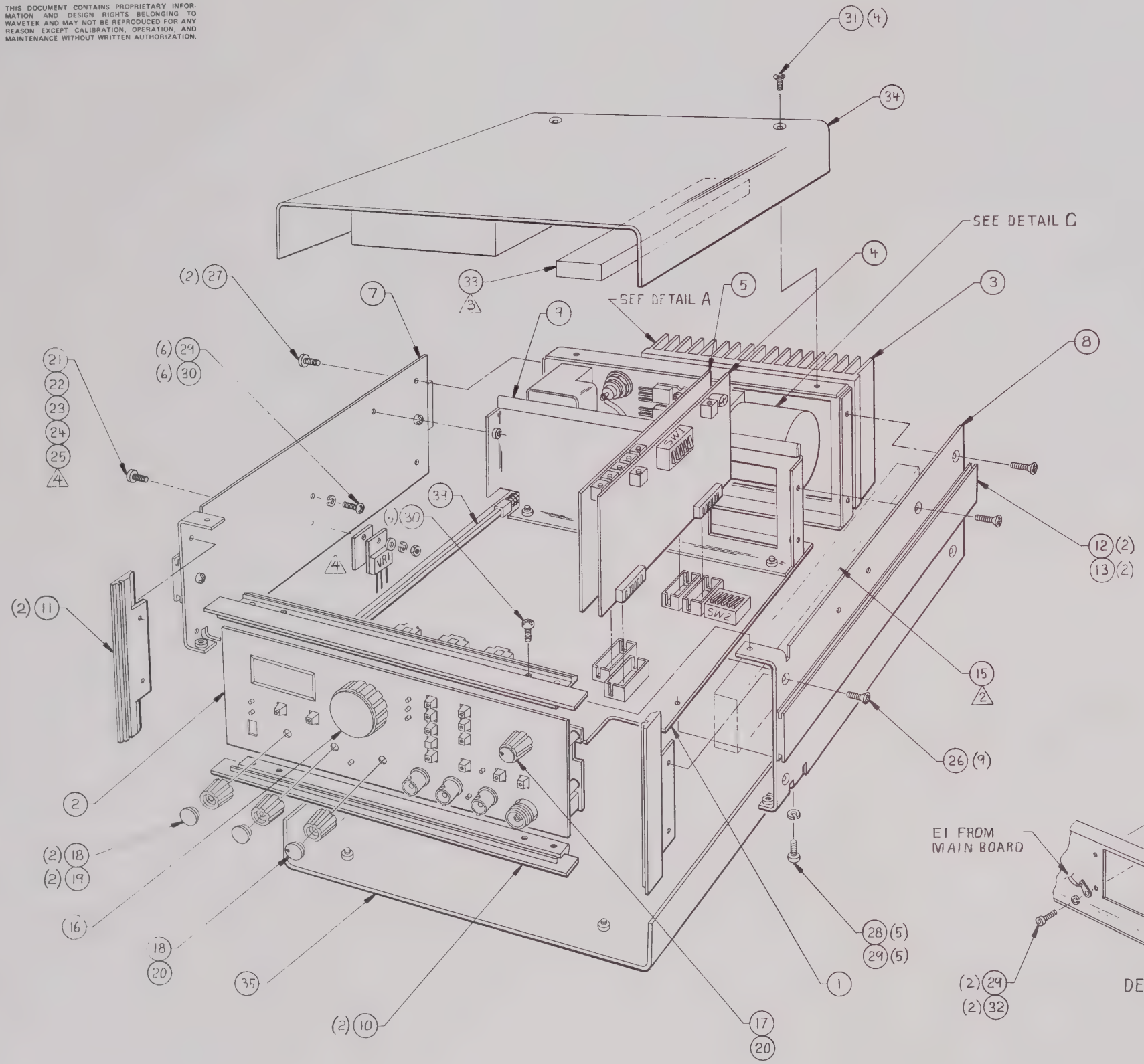
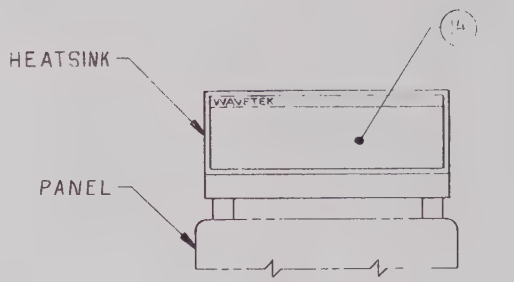
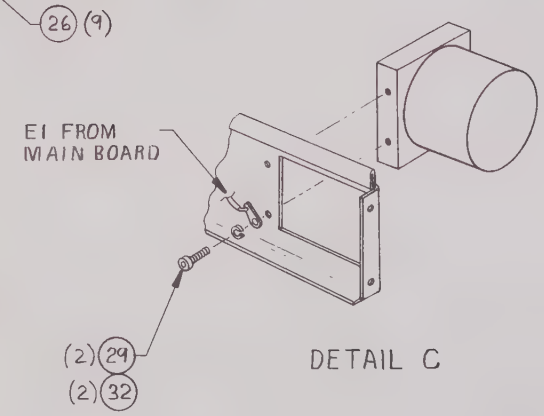
B	# 1180	[illegible]	5/12/84	[illegible]





DETAIL A



DETAIL C

Notes: Unless otherwise specified

1. Reference Chassis Assembly, Top Assembly and RF String Assembly Parts Lists.
2. RF String Assembly (Coax Assembly for 962 Standard only) in this location. See RF String Assembly Drawing for Detail.
3. Place item 33, foam tape, on inside of item 34, top cover, parallel to power supply housing and directly above plug in boards (items 4 & 5).
4. Solder VR1 to Main Board and mount to side panel with insulator and hardware as shown.

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. C.	DATE 5/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR [illegible]	7/85	TITLE ASSEMBLY, CHASSIS
FINISH WAVETEK PROCESS	RELEASE APPROV 7/17/85		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 960 SERIES	DWG NO 0002-00-0422 REV B
	SCALE NONE	CODE IDENT 23338	SHEET 1 OF 1

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG CHASSIS 962	0002-00-0422	WVTK	0002-00-0422	1
5	ASSY, MARKER BOARD	1100-00-2220	WVTK	1100-00-2220	1
4	ASSY, WAVEFORM GENERATOR BOARD	1100-00-2221	WVTK	1100-00-2221	1
1	ASSY, MAIN BOARD, 962	962-2222	WVTK	1100-00-2222	1
2	ASSY, FRONT PANEL, 962	962-2209	WVTK	1101-00-2209	1
3	ASSY, REAR PANEL	962-2233	WVTK	1101-00-2233	1
16	ASSY, FREQUENCY KNOB	1201-00-2219	WVTK	1201-00-2219	1
39	ASSY DRWG, POWER ROD	0102-00-1121	WVTK	0102-00-1211	1
39	BUTTON, POWER ROD (BLACK)	184-5011	WVTK	1400-01-5011	1
39	POWER ROD REF: 3200-04-0003	952-7481	WVTK	1400-01-7481	1
39	PLUNGER	51985	SHADW	3000-00-0092	1
11	FRONT VERTICAL RAIL REF. 3200-06-0039	952-7412	WVTK	1400-01-7412	2
11	NUT, PRESS, FLOATING (6-32)	AS-632-1	PEM	2800-16-0015	2
7	LEFT SIDE PANEL	952-7353	WVTK	1400-01-7353	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 962 | ASSEMBLY NO. 1101-00-2381 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
7	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
8	RIGHT SIDE PANEL	952-7363	WVTK	1400-01-7363	1
8	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
9	REAR BULKHEAD	952-7382	WVTK	1400-01-7382	1
9	SPACER, SWAGE .250 H, .250 DIA	6310-4-2C	LYNTR	2800-04-0002	1
9	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
12	INSERT SIDE	952-7422	WVTK	1400-01-7422	2
10	FRONT TRIM REF: 3200-06-0040	952-7432	WVTK	1400-01-7432	2
14	ID. LABEL	952-7550	WVTK	1400-01-7550	1
17	KNOB, LIGHT GRAY, 15MM .125 SHAFT COLLET	1400-01-8400	WVTK	1400-01-8400	1
18	KNOB, LIGHT GRAY, 15MM .250 SHAFT COLLET	1400-01-8410	WVTK	1400-01-8410	3
19	CAP, KNOB, LT GRAY 15MM	1400-01-8430	WVTK	1400-01-8430	2
20	CAP, KNOB, LT GRAY W/DOT, 15MM	1400-01-8440	WVTK	1400-01-8440	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 962 | ASSEMBLY NO. 1101-00-2381 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
23	WASHER	B51547F015	MOT	2800-11-0015	1
24	SCREW, NUT, HEX, CAD I, 4-40 R/P	4-40 R/P	CMRCL	2800-16-4100	1
21	SCREW, F.H. CAD I, CROSS RECESS, 4-40 X 7/16	4-40 X 7/16 F.H.	CMRCL	2800-19-4107	1
26	SCREW, F.H. CAD I, CROSS RECESS, 6-32 X 3/8	6-32 X 3/8 F.H.	CMRCL	2800-19-6106	9
28	SCREW, PAN HD, CROSS RECESS, 6-32X1/4LG	MS51957-26	COML	2800-38-6104	5
30	SCREW, PAN, CAD I CROSS RECESS,	6-32X 5/16 PAN	CMRCL	2800-38-6105	11
25	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
29	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	11
32	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2
27	SCREW PLPS FLAT M/S 82 DEG 18-8 S/S6-32X1/4	SCREW FH 6-32X1/4S/S	CMRCL	2800-52-6104	2
22	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 962 | ASSEMBLY NO. 1101-00-2381 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
15	COAX, ASSY	6009-90-0026	WVTK	6009-90-0026	1
VR1	IC	LM317T	NSC	7000-03-1700	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 962 | ASSEMBLY NO. 1101-00-2381 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, CHASSIS
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 962 / DWG NO 1101-00-2381 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG CHASSIS 962	0002-00-0422	WVTK	0002-00-0422	1
NONE	ASSY DRWG RF STRING 964	0102-00-2226	WVTK	0102-00-2226	1
1	PCA, MAINBOARD MODEL 964	964-1890	WVTK	1100-00-1890	1
5	ASSY, MARKER BOARD	1100-00-2220	WVTK	1100-00-2220	1
4	ASSY, WAVEFORM GENERATOR BOARD	1100-00-2221	WVTK	1100-00-2221	1
2	ASSY, FRONT PANEL, 964	964-2210	WVTK	1101-00-2210	1
15	ASSY, RF STRING	1101-00-2226	WVTK	1101-00-2226	1
3	ASSY, REAR PANEL	964-2234	WVTK	1101-00-2234	1
16	ASSY, FREQUENCY KNOB	1201-00-2219	WVTK	1201-00-2219	1
39	ASSY DRWG, POWER ROD	0102-00-1121	WVTK	0102-00-1211	1
39	BUTTON, POWER ROD (BLACK)	184-5011	WVTK	1400-01-5011	1
39	POWER ROD REF 3200-04-0003	952-7481	WVTK	1400-01-7481	1
39	PLUNGER	51985	SHADW	3000-00-0092	1
11	FRONT VERTICAL RAIL	952-7412	WVTK	1400-01-7412	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 964 | ASSEMBLY NO. 1101-00-2382 | REV A | PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	REF: 3200-06-0039				
11	NUT, PRESS, FLOATING (6-32)	AS-632-1	PEM	2800-16-0015	2
7	LEFT SIDE PANEL	952-7353	WVTK	1400-01-7353	1
7	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
8	RIGHT SIDE PANEL	952-7363	WVTK	1400-01-7363	1
8	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
9	REAR BULKHEAD	952-7382	WVTK	1400-01-7382	1
9	SPACER, SWAGE .250 H, 250 DIA	6310-4-2C	LYNTR	2800-04-0002	1
9	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
12	INSERT SIDE	952-7422	WVTK	1400-01-7422	2
10	FRONT TRIM REF: 3200-06-0040	952-7432	WVTK	1400-01-7432	2
14	ID. LABEL	952-7550	WVTK	1400-01-7550	1
17	KNOB, LIGHT GRAY, 15MM .125 SHAFT COLLET	1400-01-8400	WVTK	1400-01-8400	1
18	KNOB, LIGHT GRAY, 15MM .250 SHAFT	1400-01-8410	WVTK	1400-01-8410	3

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 964 | ASSEMBLY NO. 1101-00-2382 | REV A | PAGE 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	COLLET				
19	CAP, KNOB, LT GRAY 15MM	1400-01-8430	WVTK	1400-01-8430	2
20	CAP, KNOB, LT GRAY W/DOT, 15MM	1400-01-8440	WVTK	1400-01-8440	2
23	WASHER	B51547F015	MOT	2800-11-0015	1
24	SCREW, NUT, HEX, CAD I, 4-40 R/P	4-40 R/P	CMRCL	2800-16-4100	1
21	SCREW, F.H. CAD I, CROSS RECESS, 4-40 X 7/16	4-40 X 7/16 F.H.	CMRCL	2800-19-4107	1
26	SCREW, F.H. CAD I, CROSS RECESS, 6-32 X 3/8	6-32 X 3/8 F.H.	CMRCL	2800-19-6106	9
28	SCREW, PAN HD, CROSS RECESS, 6-32X1/4LG	MS51957-26	COML	2800-38-6104	5
30	SCREW, PAN, CAD I CROSS RECESS,	6-32X 5/16 PAN	CMRCL	2800-38-6105	11
25	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
29	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	11
32	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 964 | ASSEMBLY NO. 1101-00-2382 | REV A | PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
27	SCREW PLPS FLAT M/S 82 DEG 18-8 S/S6-32X1/4	SCREW FH 6-32X1/4S/S	CMRCL	2800-52-6104	2
22	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
VR1	IC	LM317T	NSC	7000-03-1700	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 964 | ASSEMBLY NO. 1101-00-2382 | REV A | PAGE 4

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, CHASSIS
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 1101-00-2382 / REV A
	SCALE		CODE IDENT 23338 / SHEET OF

BISHOP GRAPHICS-ACCUPRESS REORDER NO. A2786

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WAVETEK AND MAY NOT BE REPRODUCED FOR A
REASON EXCEPT CALIBRATION, OPERATION, A
MAINTENANCE WITHOUT WRITTEN AUTHORIZAT

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG CHASSIS 962	0002-00-0422	WVTK	0002-00-0422	1
NONE	ASSY DRWG RF STRING 965	0102-00-2227	WVTK	0102-00-2227	1
1	PCA, MAINBOARD MODEL 965	965-1893	WVTK	1100-00-1893	1
5	ASSY, MARKER BOARD	1100-00-2220	WVTK	1100-00-2220	1
4	ASSY, WAVEFORM GENERATOR BOARD	1100-00-2221	WVTK	1100-00-2221	1
2	ASSY, FRONT PANEL, 965	965-2211	WVTK	1101-00-2211	1
15	ASSY, RF STRING	1101-00-2227	WVTK	1101-00-2227	1
3	ASSY, REAR PANEL	965-2235	WVTK	1101-00-2235	1
16	ASSY, FREQUENCY KNOB	1201-00-2219	WVTK	1201-00-2219	1
39	ASSY DRWG, POWER ROD	0102-00-1121	WVTK	0102-00-1211	1
39	BUTTON,POWER ROD (BLACK)	184-5011	WVTK	1400-01-5011	1
39	POWER ROD REF 3200-04-0003	952-7481	WVTK	1400-01-7481	1
39	PLUNGER	51985	SHADW	3000-00-0092	1
11	FRONT VERTICAL RAIL	952-7412	WVTK	1400-01-7412	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 965 | ASSEMBLY NO. 1101-00-2383 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	REF 3200-06-0039				
11	NUT, PRESS, FLOATING (6-32)	AS-632-1	PEM	2800-16-0015	2
7	LEFT SIDE PANEL	952-7353	WVTK	1400-01-7353	1
7	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
8	RIGHT SIDE PANEL	952-7363	WVTK	1400-01-7363	1
8	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
9	REAR BULKHEAD	952-7382	WVTK	1400-01-7382	1
9	SPACER, SWAGE .250 H, .250 DIA	6310-4-2C	LYNTR	2800-04-0002	1
9	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
12	INSERT SIDE	952-7422	WVTK	1400-01-7422	2
10	FRONT TRIM REF: 3200-06-0040	952-7432	WVTK	1400-01-7432	2
14	ID. LABEL	952-7550	WVTK	1400-01-7550	1
17	KNOB, LIGHT GRAY, 15MM .125 SHAFT COLLET	1400-01-8400	WVTK	1400-01-8400	1
18	KNOB, LIGHT GRAY, 15MM .250 SHAFT	1400-01-8410	WVTK	1400-01-8410	3

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 965 | ASSEMBLY NO. 1101-00-2383 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	COLLET				
19	CAP, KNOB, LT GRAY 15MM	1400-01-8430	WVTK	1400-01-8430	2
20	CAP, KNOB, LT GRAY W/DOT, 15MM	1400-01-8440	WVTK	1400-01-8440	2
23	WASHER	B51547F015	MOT	2800-11-0015	1
24	SCREW, NUT, HEX, CAD I, 4-40 R/P	4-40 R/P	CMRCL	2800-16-4100	1
21	SCREW, F.H. CAD I, CROSS RECESS, 4-40 X 7/16	4-40 X 7/16 F.H.	CMRCL	2800-19-4107	1
26	SCREW, F.H. CAD I, CROSS RECESS, 6-32 X 3/8	6-32 X 3/8 F.H.	CMRCL	2800-19-6106	9
28	SCREW, PAN HD, CROSS RECESS, 6-32X1/4LG	MS51957-26	COML	2800-38-6104	5
30	SCREW, PAN, CAD I CROSS RECESS,	6-32X 5/16 PAN	CMRCL	2800-38-6105	11
25	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
29	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	11
32	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 965 | ASSEMBLY NO. 1101-00-2383 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
27	SCREW PLPS FLAT M/S 82 DEG 18-8 S/S6-32X1/4	SCREW FH 6-32X1/4S/S	CMRCL	2800-52-6104	2
22	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
VR1	IC	LM317T	NSC	7000-03-1700	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 965 | ASSEMBLY NO. 1101-00-2383 | REV

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES | MATERIAL | FINISH WAVETEK PROCESS | DRAWN | DATE | PROJENGR | RELEASE APPROV | TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030 | DO NOT SCALE DWG | SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST ASSY, CHASSIS

MODEL NO 965 | DWG NO 1101-00-2383 | REV

CODE IDENT 23338 | SHEET | OF

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REORDER NO. A27088

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG CHASSIS 962	0002-00-0422	WVTK	0002-00-0422	1
NONE	ASSY DRWG RF STRING 967	0102-00-2228	WVTK	0102-00-2228	1
1	PCA, MAINBOARD MODEL 967	967-1896	WVTK	1100-00-1896	1
5	ASSY, MARKER BOARD	1100-00-2220	WVTK	1100-00-2220	1
4	ASSY, WAVEFORM GENERATOR BOARD	1100-00-2221	WVTK	1100-00-2221	1
2	ASSY, FRONT PANEL, 967	967-2212	WVTK	1101-00-2212	1
15	ASSY, RF STRING	1101-00-2228	WVTK	1101-00-2228	1
3	ASSY, REAR PANEL	967-2236	WVTK	1101-00-2236	1
16	ASSY, FREQUENCY KNOB	1201-00-2219	WVTK	1201-00-2219	1
39	ASSY DRWG, POWER ROD	0102-00-1121	WVTK	0102-00-1211	1
39	BUTTON, POWER ROD (BLACK)	184-5011	WVTK	1400-01-5011	1
39	POWER ROD REF: 3200-04-0003	952-7481	WVTK	1400-01-7481	1
39	PLUNGER	51985	SHADW	3000-00-0092	1
11	FRONT VERTICAL RAIL	952-7412	WVTK	1400-01-7412	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 967 | ASSEMBLY NO. 1101-00-2384 | REV A | PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	REF: 3200-06-0039				
11	NUT, PRESS, FLOATING (6-32)	AS-632-1	PEM	2800-16-0015	2
7	LEFT SIDE PANEL	952-7353	WVTK	1400-01-7353	1
7	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
8	RIGHT SIDE PANEL	952-7363	WVTK	1400-01-7363	1
8	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
9	REAR BULKHEAD	952-7382	WVTK	1400-01-7382	1
9	SPACER, SWAGE .250 H, .250 DIA	6310-4-2C	LYNTR	2800-04-0002	1
9	NUT, PRESS	S-632-2	PEM	2800-12-0012	1
12	INSERT SIDE	952-7422	WVTK	1400-01-7422	2
10	FRONT TRIM REF: 3200-06-0040	952-7432	WVTK	1400-01-7432	2
14	ID. LABEL	952-7550	WVTK	1400-01-7550	1
17	KNOB, LIGHT GRAY, 15MM .125 SHAFT COLLET	1400-01-8400	WVTK	1400-01-8400	1
18	KNOB, LIGHT GRAY, 15MM .250 SHAFT	1400-01-8410	WVTK	1400-01-8410	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 967 | ASSEMBLY NO. 1101-00-2384 | REV A | PAGE 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	COLLET				
19	CAP, KNOB, LT GRAY 15MM	1400-01-8430	WVTK	1400-01-8430	2
20	CAP, KNOB, LT GRAY W/DOT, 15MM	1400-01-8440	WVTK	1400-01-8440	2
23	WASHER	B51547F015	MOT	2800-11-0015	1
24	SCREW, NUT, HEX, CAD I, 4-40 R/P	4-40 R/P	CMRCL	2800-16-4100	1
21	SCREW, F.H. CAD I, CROSS RECESS, 4-40 X 7/16	4-40 X 7/16 F.H.	CMRCL	2800-19-4107	1
26	SCREW, F.H. CAD I, CROSS RECESS, 6-32 X 3/8	6-32 X 3/8 F.H.	CMRCL	2800-19-6106	9
28	SCREW, PAN HD, CROSS RECESS, 6-32X1/4LG	MS51957-26	COML	2800-38-6104	5
30	SCREW, PAN, CAD I CROSS RECESS,	6-32X 5/16 PAN	CMRCL	2800-38-6105	11
25	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
29	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	11
32	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 967 | ASSEMBLY NO. 1101-00-2384 | REV A | PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
27	SCREW PLPS FLAT M/S 82 DEG 18-8 S/S6-32X1/4	SCREW FH 6-32X1/4S/S	CMRCL	2800-52-6104	2
22	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
VR1	IC	LM317T	NSC	7000-03-1700	1

WAVETEK PARTS LIST | TITLE: ASSY, CHASSIS 967 | ASSEMBLY NO. 1101-00-2384 | REV A | PAGE 4

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES | MATERIAL | FINISH WAVETEK PROCESS | DRAWN | DATE | PROJENGR | RELEASE APPROV | TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030 | DO NOT SCALE DWG | SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST ASSY, CHASSIS

MODEL NO 967 | DWG NO 1101-00-2384 | REV A | CODE IDENT 23338 | SHEET OF

B SHOP GRAPHICS ACCUPRESS REORDER NO. A2708

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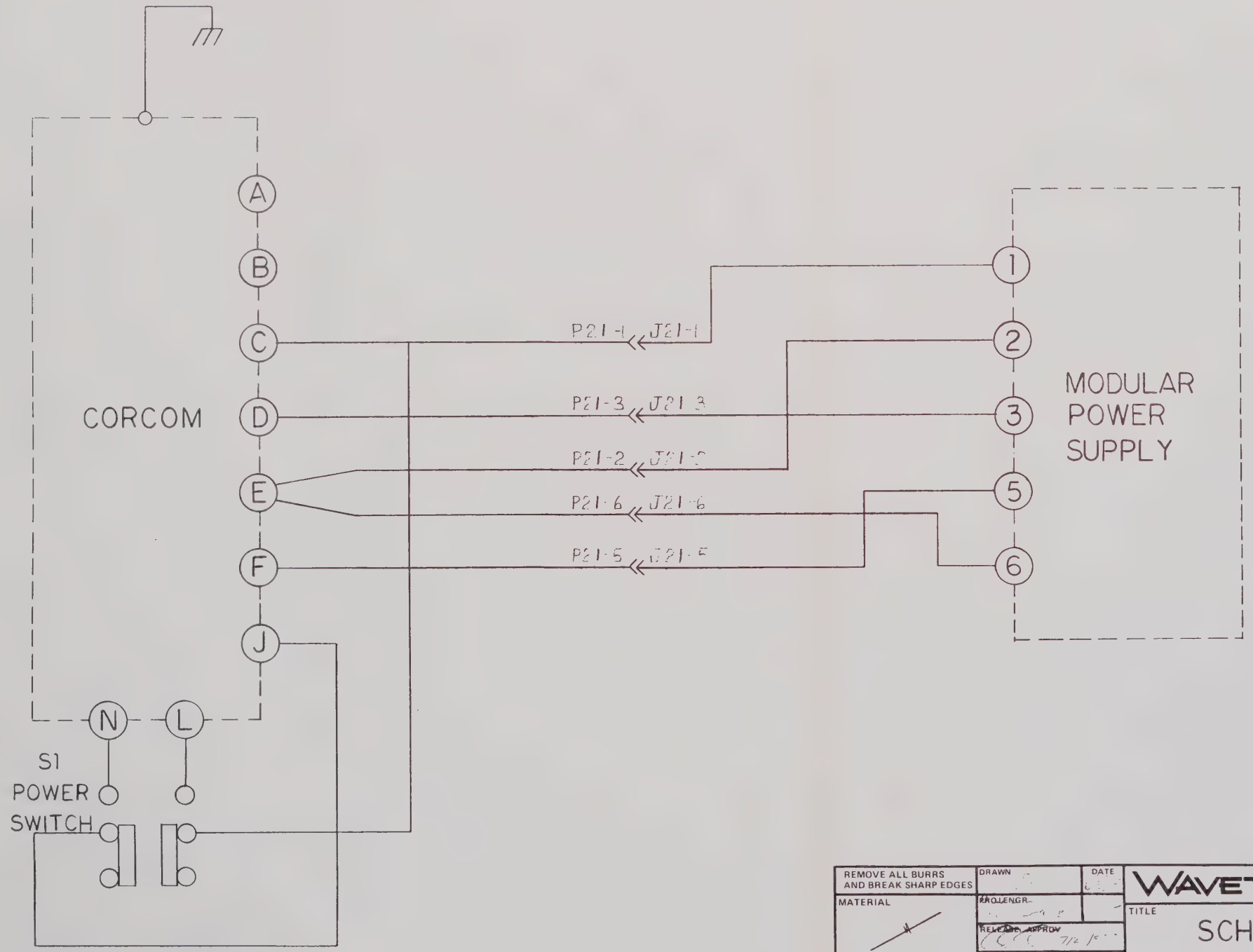
REV	ECN	BY	DATE	APP
A	RELEASED			



NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE
MATERIAL	ENGR	
FINISH WAVETEK PROCESS	RELEASE APPROV	
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030	
	DO NOT SCALE DWG	
	SCALE	

WAVETEK SAN DIEGO • CALIFORNIA

TITLE
SCHEMATIC
OSC & REAR PANEL

MODEL NO.	DWG NO.	REV
402	0103-00-2243	A
CODE IDENT 23338	SHEET 1 OF 2	

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A 4831

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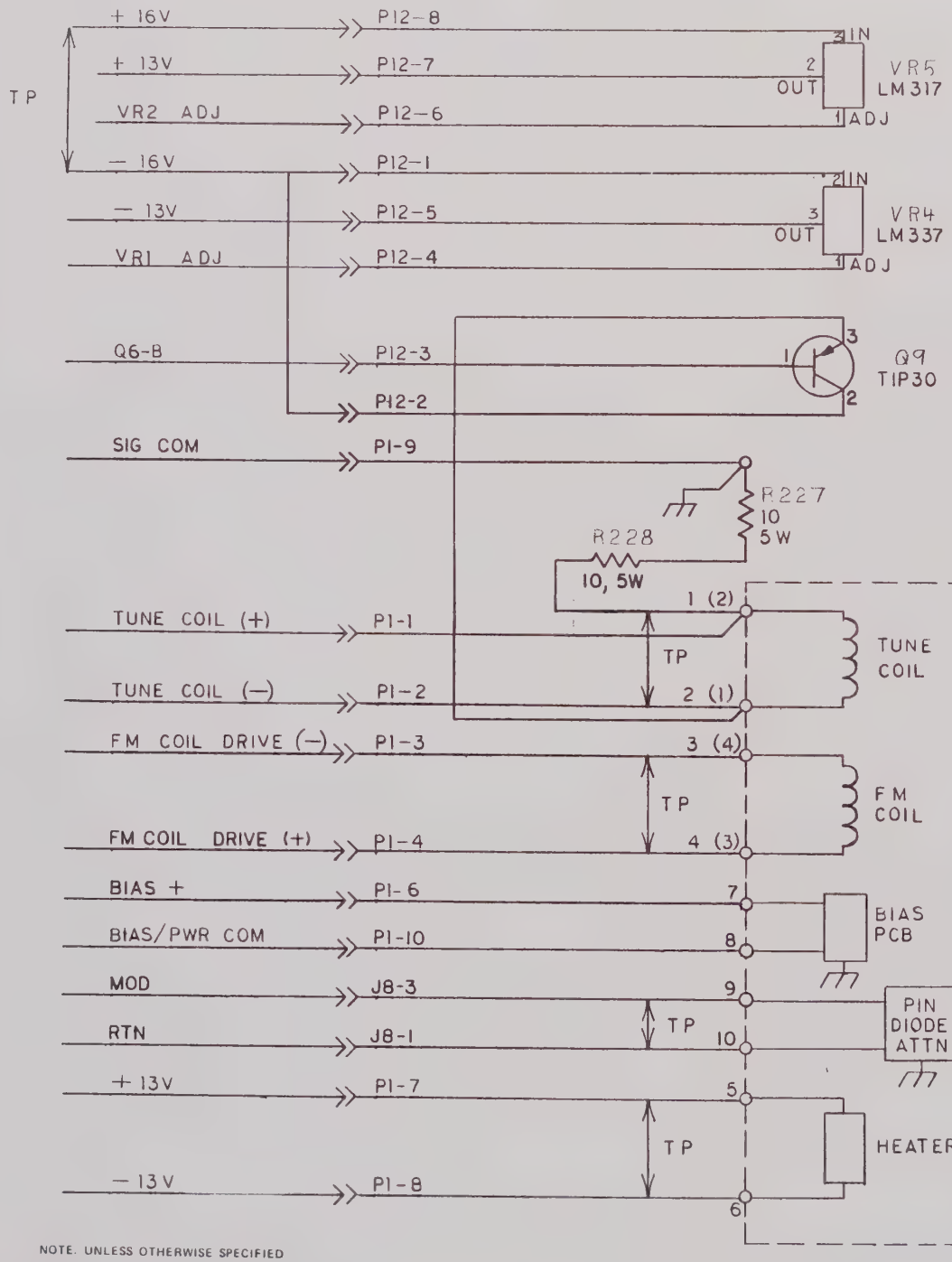
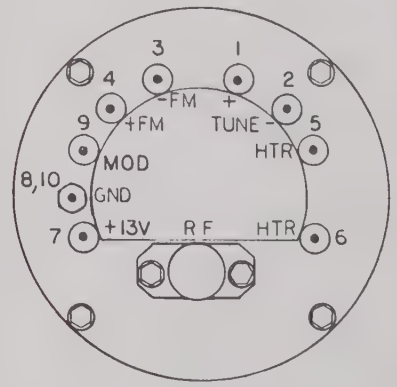


NOTE. UNLESS OTHERWISE SPECIFIED



TOP VIEW COVER
OSCILLATOR PIN CONNECTIONS

OSC Pin #	Description	Connector Pin #	Color Code
1*	Tuning Coil +	J1 - 1	Brown
2*	Tuning Coil -	2	Red
3*	FM Coil -	3	YELLOW
4*	FM Coil +	4	ORANGE
5	Heater +	7	Purple
6	Heater -	8	Grey
7	Bias +	6	Blue
8	Bias - RTN	J1-10	White/Black
9	MOD	J8-3	ORANGE
10	RTN	J8-1	BROWN

(B)

* Oscillator Pins 1 and 2 and Pins 3 and 4 may be reversed as a result of oscillator calibration. (DO NOT CHANGE)

TP = TWISTED PAIR

REMOVE ALL BURRS AND BREAK SHARP EDGES
MATERIAL
FINISH WAVETEK PROCESS
DRAWN
DATE
TOLERANCE UNLESS OTHERWISE SPECIFIED
XXX ±.010 ANGLES ±1°
XX ±.030
DO NOT SCALE DWG
SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE
SCHEMATIC
OSC & REAR PANEL

MODEL NO 1[illegible]
DWG NO. 0103-00-2243
REV A
CODE IDENT 23338
SHEET 2 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-4821

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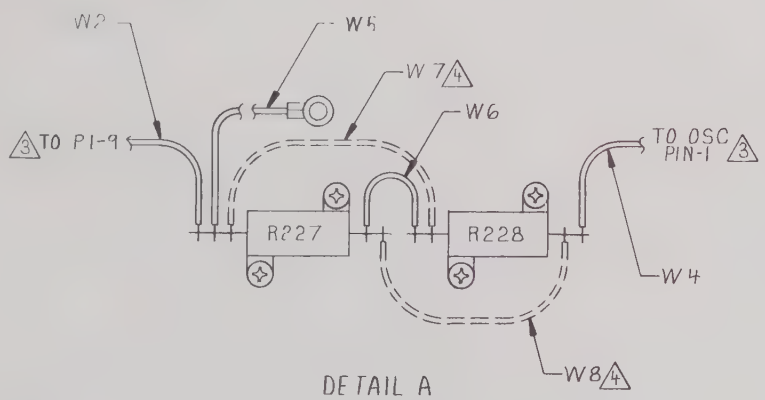
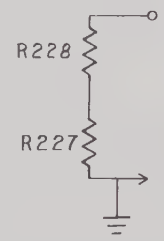
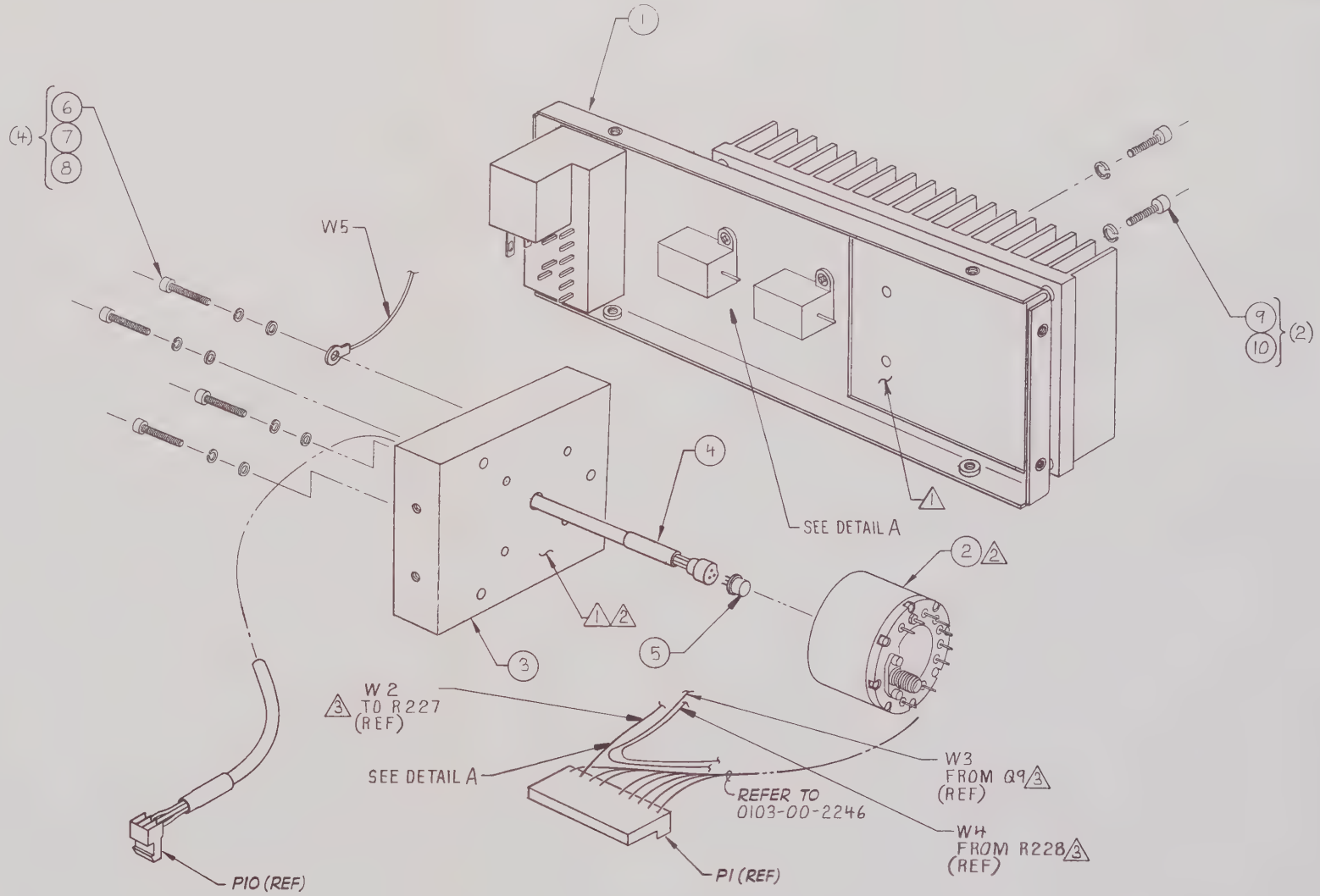
REV	ECN	BY	DATE	APP
A	AS PER AS			



DETAIL A



SCHEMATIC
DETAIL A



4 REMOVE JUMPER WIRES W7 & W8.

3 ROUTE JUMPER WIRES W2, W3 & W4 WITH P1 WIRING TO OSCILLATOR.

2 NOTE ORIENTATION OF MOUNTING BLOCK AND OSCILLATOR.

1 USE THERMAL COMPOUND, DOW CORNING 340, OR EQUIV, AS REQUIRED BETWEEN MATING SURFACES.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 9/30/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR. R.C. Stark	7/85	TITLE ASSY, REAR PANEL
FINISH WAVETEK PROCESS	RELEASED VERSION 12 C 11/25/85		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG		
	SCALE NONE	MODEL NO 161	DWG NO 0102-00-2233 REV A
		CODE IDENT 23338	SHEET 1 OF 1

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REAR PANEL	0102-00-2233	WVTK	0102-00-2233	1
NONE	OSCILLATOR AND REAR PANEL SCHEMATIC	967-2246	WVTK	0103-00-2246	1
4	ASSY DRWG, THERMAL SENSOR	0102-00-1181	WVTK	0102-00-1181	1
4	SOCKET, TRANS 3PIN	027-6700-00-239	SLTRO	2100-03-0071	1
4	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1
2	OSCILLATOR AND REAR PANEL SCHEMATIC	962-2243	WVTK	0103-00-2243	1
2	ASSY, OSC CABLE	904-1047	WVTK	1207-00-1047	1
2	OSCILLATOR	MS0104-250-XX	MICRS	2300-99-0016	1
1	ASSY DRWG, REAR PANEL	0102-00-2242	WVTK	0102-00-2242	1
1	ASSY, REAR PANEL	952-1325	WVTK	1206-00-1325	1
1	ASSY, CABLES & WIRES	1207-00-2237	WVTK	1207-00-2237	1
1	INSULATOR, PWR SWITCH REF: 1600-99-0001	801-8370	WVTK	1400-00-8370	1
1	REAR HEATSINK REF: 3200-06-0002	957A-7283	WVTK	1400-01-7283	1
1	SHIELD, AC LINE	957A-7711	WVTK	1400-01-7711	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2233 | REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	6				
1	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
1	RES, WW, 5W, 1%, 10	RE60Q10R0	DALE	4702-65-0100	1
1	TRANS	TIP-30	TI	4902-00-0300	1
1	SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1
1	IC	LM317T	NSC	7000-03-1700	1
1	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1
3	OSCI. MOUNTING BLOCK	957A-7440	WVTK	1400-01-7440	1
7	LOCKWASHER REQ, S/S #4	MS 35338-135	CMRCL	2800-45-4000	4
10	LOCKWASHER REQ STAINLESS #6	MS 35338-136	CMRCL	2800-45-6000	2
8	WASHER, FLAT, S/S #4	#4 WASHER STN	CMRCL	2800-46-4000	4
6	SCREW, CAP, SOCKET HD, 4-40X3/4	4-40X3/4 18-8 S/S	CMRCL	2800-49-4112	4
9	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2
5	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2233 | REV

PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	SILKSCREEN, COVER PLATE, BNC	1400-01-9990	WVTK	1400-01-9990	1
1	BNC CONN	KC-7946	KINO	2100-01-0002	1
1	RECEPTACLE	6J4	CORCM	2100-03-0048	1
1	SOLDER LUG	1497	SMITH	2100-04-0012	1
1	FUSE, 1A, 250V, S-B	MDL 1	BUSS	2400-05-0029	1
1	WASHER	B51547F015	MOT	2800-11-0015	1
1	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	1
1	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-3	COML	2800-38-2104	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	1
1	SCREW, PAN, CAD I CROSS RECESS,	6-32 X 5/8 PAN	CMRCL	2800-38-6110	1
1	LOCKWASHER, #2 SPLIT BIN 525	#2SRLW	CMRCL	2800-42-2000	1
1	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
1	WASHER, SPLIT LOCK #6	#6SRLW	CMRCL	2800-42-6000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2233 | REV

PAGE 2

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST ASSY, REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 962 / DWG NO 1101-00-2233 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET / OF
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A27086

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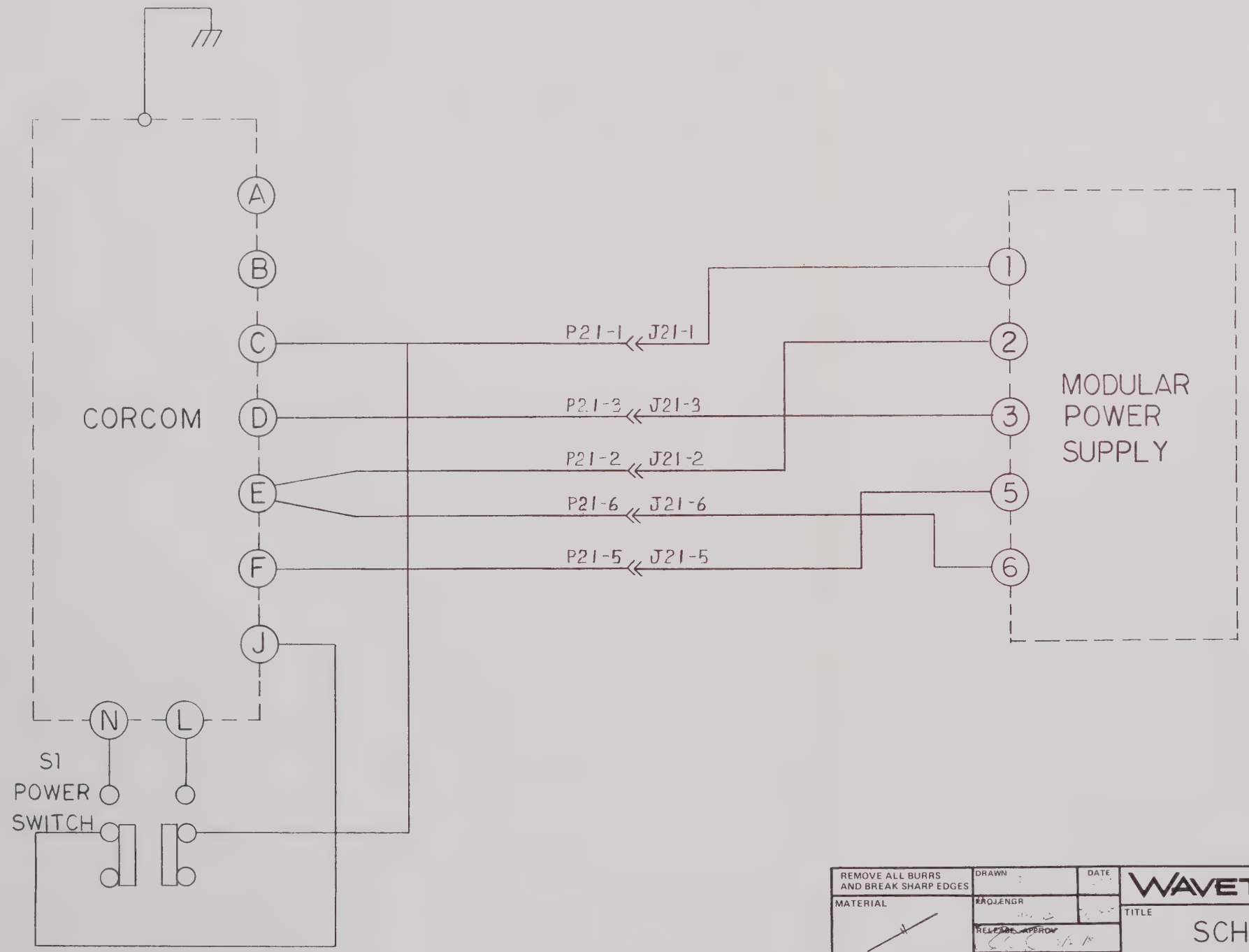
REV	ECN	BY	DATE	APP
A	RELEASED	AC	7/85	AC



NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE
MATERIAL	RAQUENGR	
	RELEASE APPROV	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030	
	DO NOT SCALE DWG	
	SCALE	

WAVETEK SAN DIEGO • CALIFORNIA

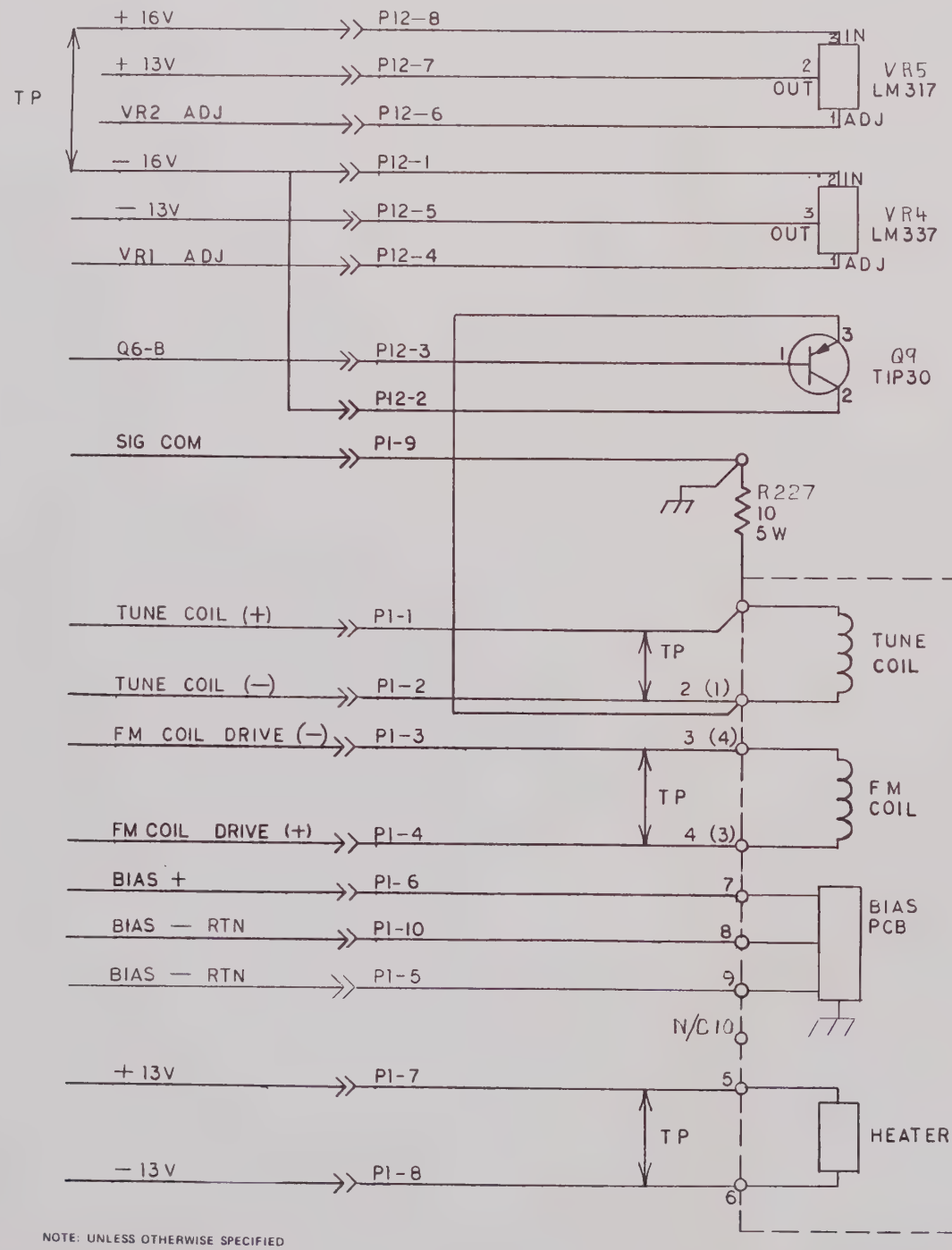
TITLE
SCHEMATIC
OSC & REAR PANEL

MODEL NO	DWG NO.	REV
	0103-00-2241	
CODE IDENT 23338	SHEET 1 OF 2	

BISHOP GRAPHICS/ACCUPRESS REORDER NO A 4831

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY REASON EXCEPT CALIBRATION, OPERATION, AND MAINTENANCE WITHOUT WRITTEN AUTHORIZATION

REV	ECN	BY	DATE	APPV



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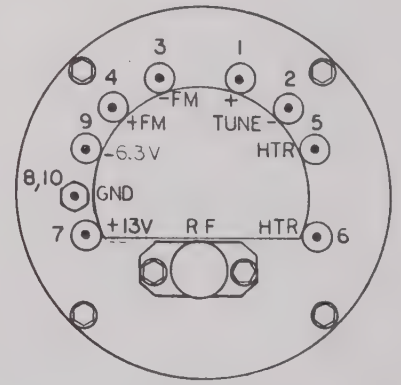

TOP VIEW COVER
OSCILLATOR PIN CONNECTIONS

OSC Pin #	Description	Connector Pin #	Color Code
1*	Tuning Coil +	J1 - 1	Brown
2*	Tuning Coil -	2	Red
3*	FM Coil -	3	YELLOW
4*	FM Coil +	4	ORANGE
5	Heater +	7	Purple
6	Heater -	8	Grey
7	Bias +	6	Blue
8	Bias - RTN	10	White/Black
9	Bias - RTN	J1 - 5	G
10	N/C		

(B)

* Oscillator Pins 1 and 2 and Pins 3 and 4 may be reversed as a result of oscillator calibration. (DO NOT CHANGE)

TP = TWISTED PAIR

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN VGC	DATE 6/3/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROLENGR		TITLE SCHEMATIC OSC & REAR PANEL
	RELEASED APPROV	7/26/85	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		MODEL NO. 964 / DWG NO. 0103-00-2244 / REV A
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 2 OF 2
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-4831

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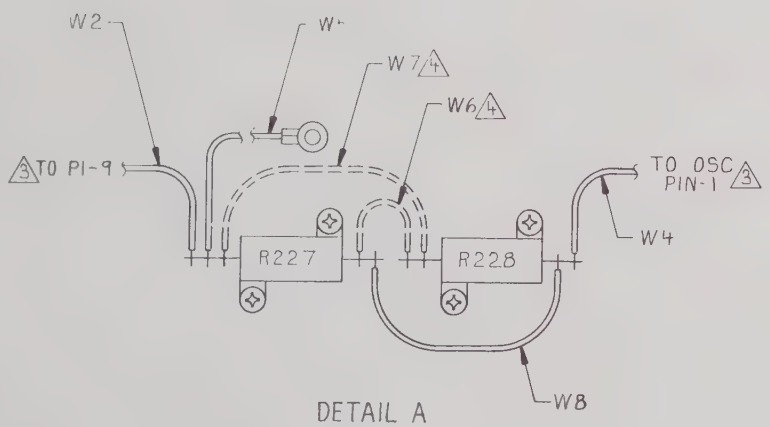
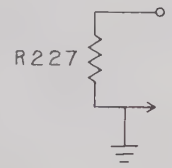
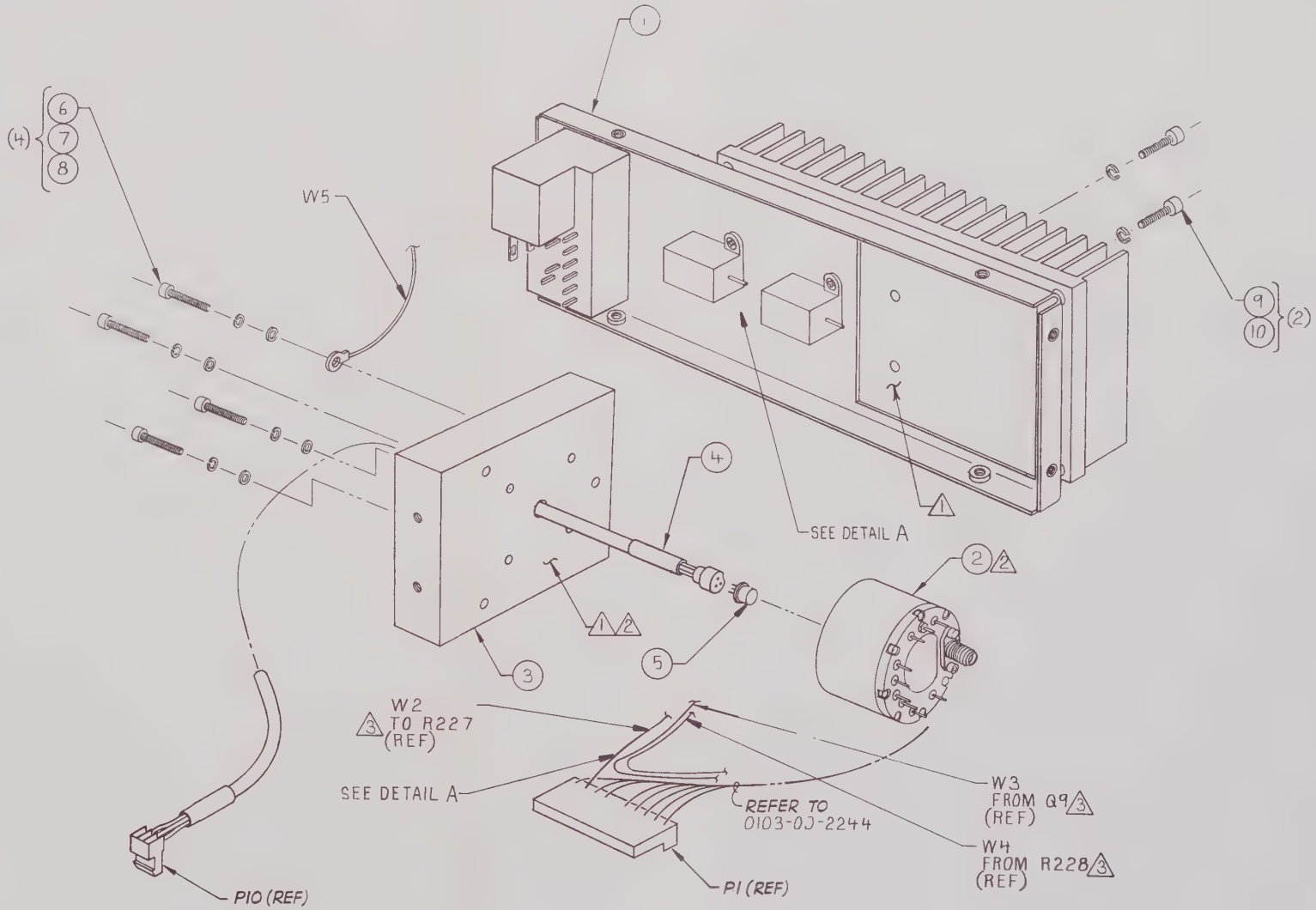
REV	ECN	BY	DATE	APP



DETAIL A



SCHEMATIC DETAIL A



△4 REMOVE JUMPER WIRES W6 & W7.

△3 ROUTE JUMPER WIRES W2 W3 & W4 WITH P1 WIRING TO OSCILLATOR.

△2 NOTE ORIENTATION OF MOUNTING BLOCK AND OSCILLATOR.

△1 USE THERMAL COMPOUND, DOW CORNING 340, OR EQUIV, AS REQUIRED BETWEEN MATING SURFACES.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 5/30/05	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJ ENGR. [illegible]	1/25	TITLE ASSY, REAR PANEL
FINISH WAVETEK PROCESS —	RELEASED 7/25/05		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1°		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 0102-00-2234 / REV A
	SCALE NONE		CODE IDENT 23338 / SHEET OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A3861

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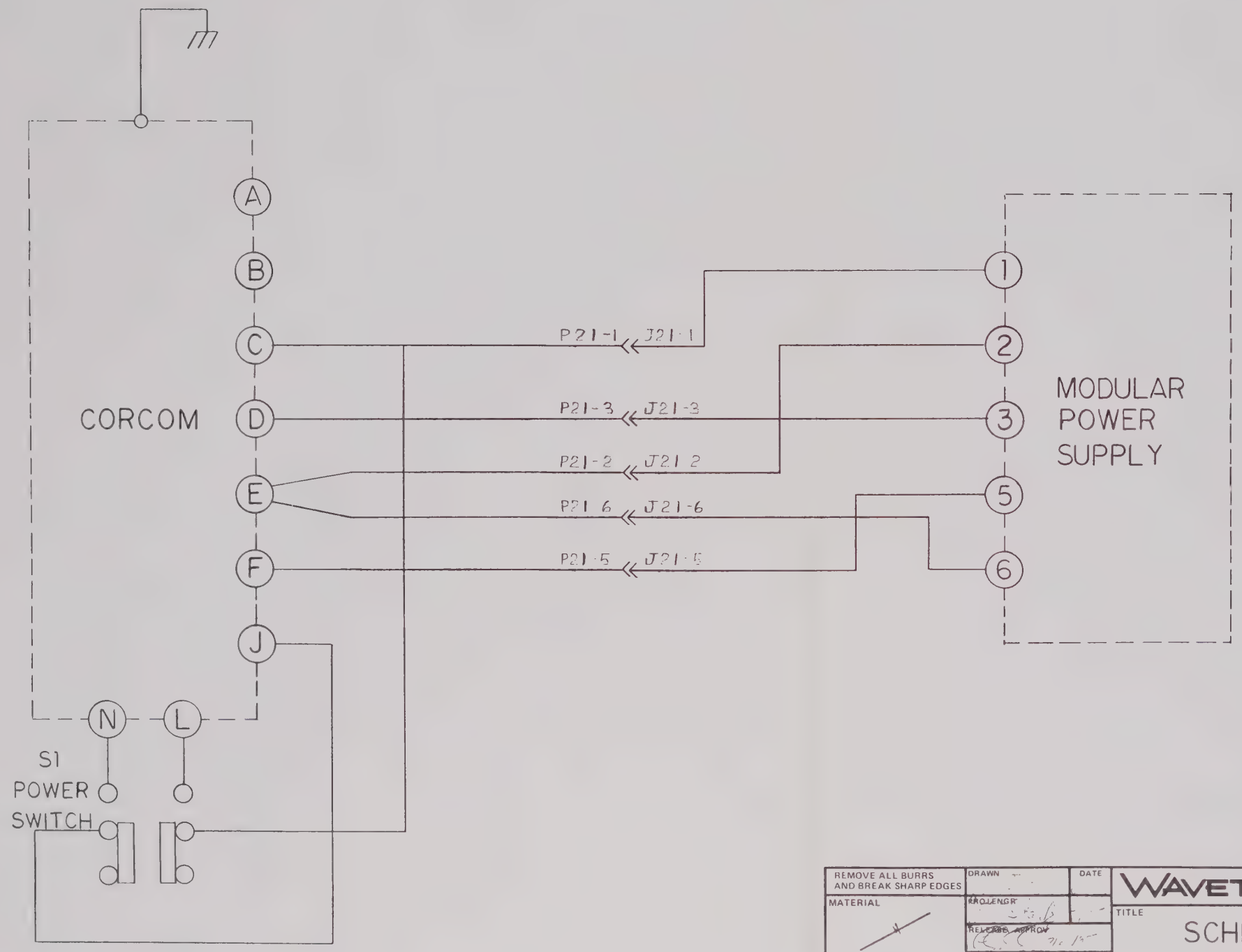
REV	ECN	BY	DATE	APP
A	RELEASED	AS	[illegible]	



NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE
MATERIAL	ENGR	
	RELEASE APPROV	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030	
	DO NOT SCALE DWG	
	SCALE	

WAVETEK SAN DIEGO • CALIFORNIA

TITLE
SCHEMATIC
OSC & REAR PANEL

MODEL NO	DWG NO	REV
	0103-00-	
CODE IDENT 23338	SHEET 1 OF 2	

BISHOP GRAPHICS/ACCUPRESS REORDER NO A 48-1

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY REASON EXCEPT CALIBRATION, OPERATION, AND MAINTENANCE WITHOUT WRITTEN AUTHORIZATION

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REAR PANEL	0102-00-2234	WVTK	0102-00-2234	1
NONE	OSCILLATOR AND REAR PANEL SCHEMATIC	964-2244	WVTK	0103-00-2244	1
4	ASSY DRWG, THERMAL SENSOR	0102-00-1181	WVTK	0102-00-1181	1
4	SOCKET, TRANS 3PIN	027-6700-00-239	SLTRO	2100-03-0071	1
4	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1
2	OSCILLATOR AND REAR PANEL SCHEMATIC	964-2244	WVTK	0103-00-2244	1
2	ASSY, OSC CABLE	904-1047	WVTK	1207-00-1047	1
2	OSCILLATOR, YIG-954	MS00308-250-XX	MICRS	2300-99-0017	1
1	ASSY DRWG, REAR PANEL	0102-00-2242	WVTK	0102-00-2242	1
1	ASSY, REAR PANEL	952-1325	WVTK	1206-00-1325	1
1	ASSY, CABLES & WIRES	1207-00-2237	WVTK	1207-00-2237	1
1	INSULATOR, PWR SWITCH REF: 1600-99-0001	801-8370	WVTK	1400-00-8370	1
1	REAR HEATSINK REF: 3200-06-0002	957A-7283	WVTK	1400-01-7283	1
1	SHIELD, AC LINE	957A-7711	WVTK	1400-01-7711	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2234 | REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	SILKSCREEN, COVER PLATE, BNC	1400-01-9990	WVTK	1400-01-9990	1
1	BNC CONN	KC-7946	KING	2100-01-0002	1
1	RECEPTACLE	6J4	CORCM	2100-03-0048	1
1	SOLDER LUG	1497	SMITH	2100-04-0012	1
1	FUSE, 1A, 250V, S-B	MDL 1	BUSS	2400-05-0029	1
1	WASHER	B51547F015	MOT	2800-11-0015	1
1	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	1
1	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-3	COML	2800-38-2104	1
1	SCREW, PAN, CAD I, CROSS RECESS.	MS51957-13	COML	2800-38-4104	1
1	SCREW, PAN, CAD I CROSS RECESS,	6-32 X 5/8 PAN	CMRCL	2800-38-6110	1
1	LOCKWASHER, #2 SPLIT BIN 525	#2SRLW	CMRCL	2800-42-2000	1
1	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
1	WASHER, SPLIT LOCK #6	#6SRLW	CMRCL	2800-42-6000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2234 | REV

PAGE 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	6				
1	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
1	RES, WW, 5W, 1%, 1Ω	RE60Q10R0	DALE	4702-65-0100	1
1	TRANS	TIP-30	TI	4902-00-0300	1
1	SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1
1	IC	LM317T	NSC	7000-03-1700	1
1	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1
3	OSCI. MOUNTING BLOCK	957A-7440	WVTK	1400-01-7440	1
7	LOCKWASHER REQ. S/S #4	MS 35338-135	CMRCL	2800-45-4000	4
10	LOCKWASHER REQ STAINLESS #6	MS 35338-136	CMRCL	2800-45-6000	2
8	WASHER, FLAT, S/S #4	#4 WASHER STN	CMRCL	2800-46-4000	4
6	SCREW, CAP, SOCKET HD, 4-40X3/4	4-40X3/4 18-8 S/S	CMRCL	2800-49-4112	4
9	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2
5	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2234 | REV

PAGE 3

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, REAR PANRL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 1101-00-2234 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

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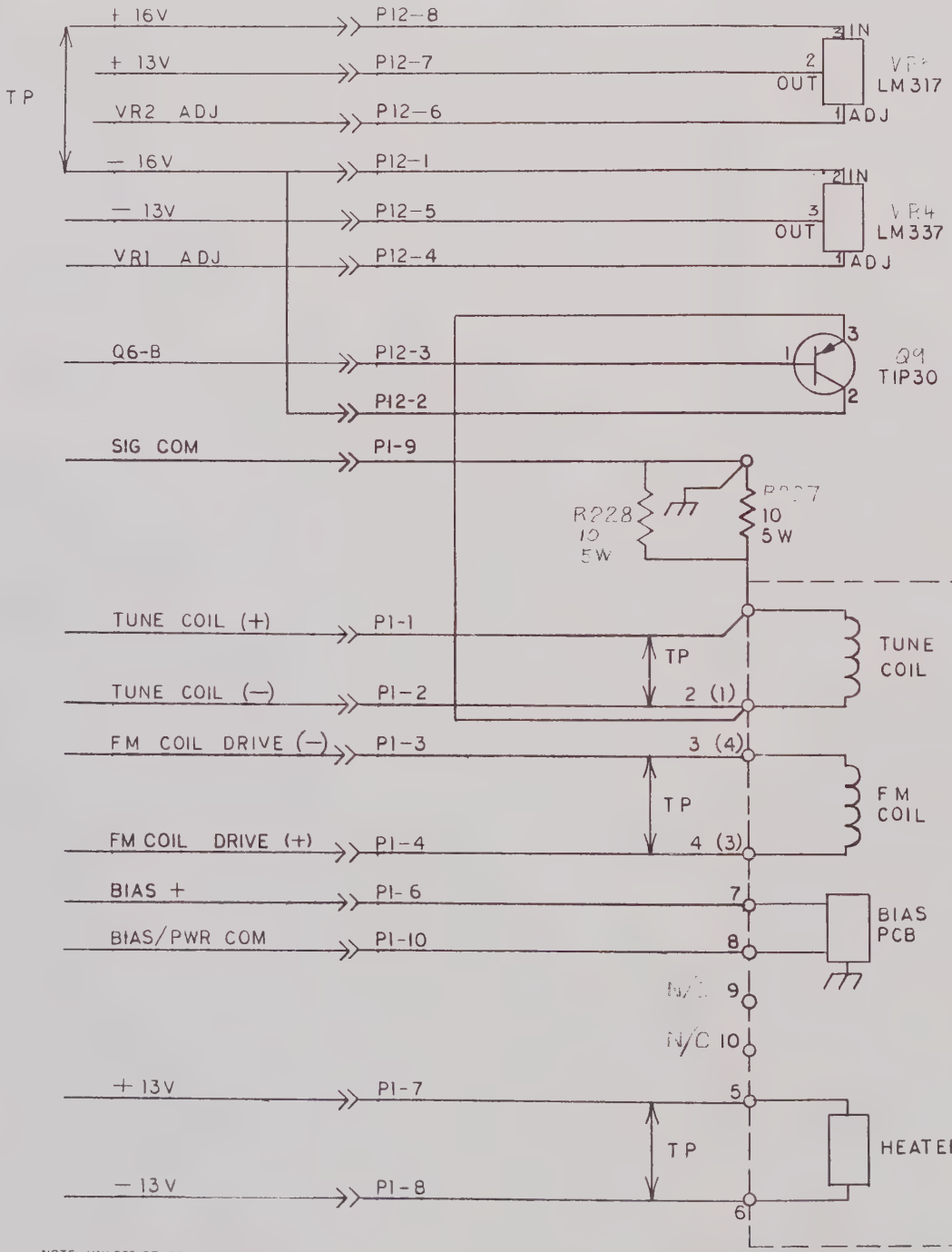
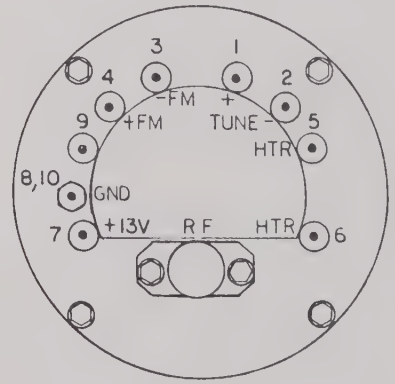


NOTE: UNLESS OTHERWISE SPECIFIED

TP = TWISTED PAIR



TOP VIEW COVER
OSCILLATOR PIN CONNECTIONS

OSC Pin #	Description	Connector Pin #	Color Code
1*	Tuning Coil +	J1 - 1	Brown
2*	Tuning Coil -	2	Red
3*	FM Coil -	3	YELLOW
4*	FM Coil +	4	ORANGE
5	Heater +	7	Purple
6	Heater -	8	Grey
7	Bias +	6	Blue
8	Bias - RTN	J1-10	White/Black
9	N/C		
10	N/C		

(B)

* Oscillator Pins 1 and 2 and Pins 3 and 4 may be reversed as a result of oscillator calibration. (DO NOT CHANGE)

REMOVE ALL BURRS AND BREAK SHARP EDGES
MATERIAL
FINISH WAVETEK PROCESS
DRAWN Jee DATE 6/5/85
TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030
DO NOT SCALE DWG
SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE
SCHEMATIC
OSC & REAR PANEL

MODEL NO 1061
DWG NO 0103-00-2245
REV A
CODE IDENT 23338
SHEET 2 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-4831

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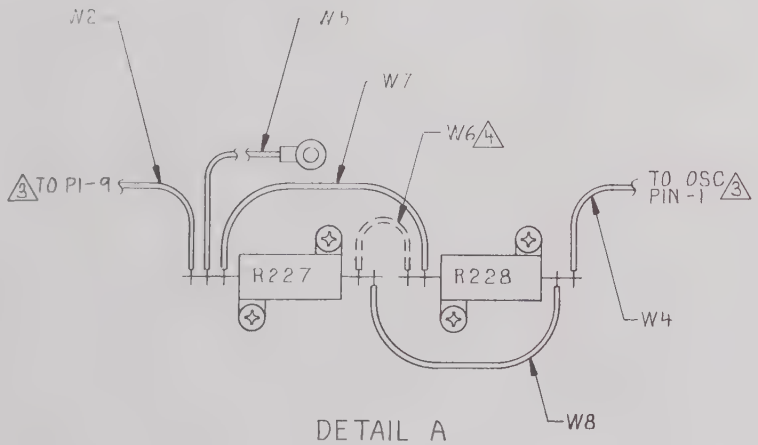
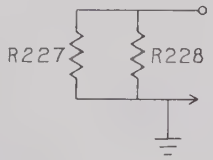
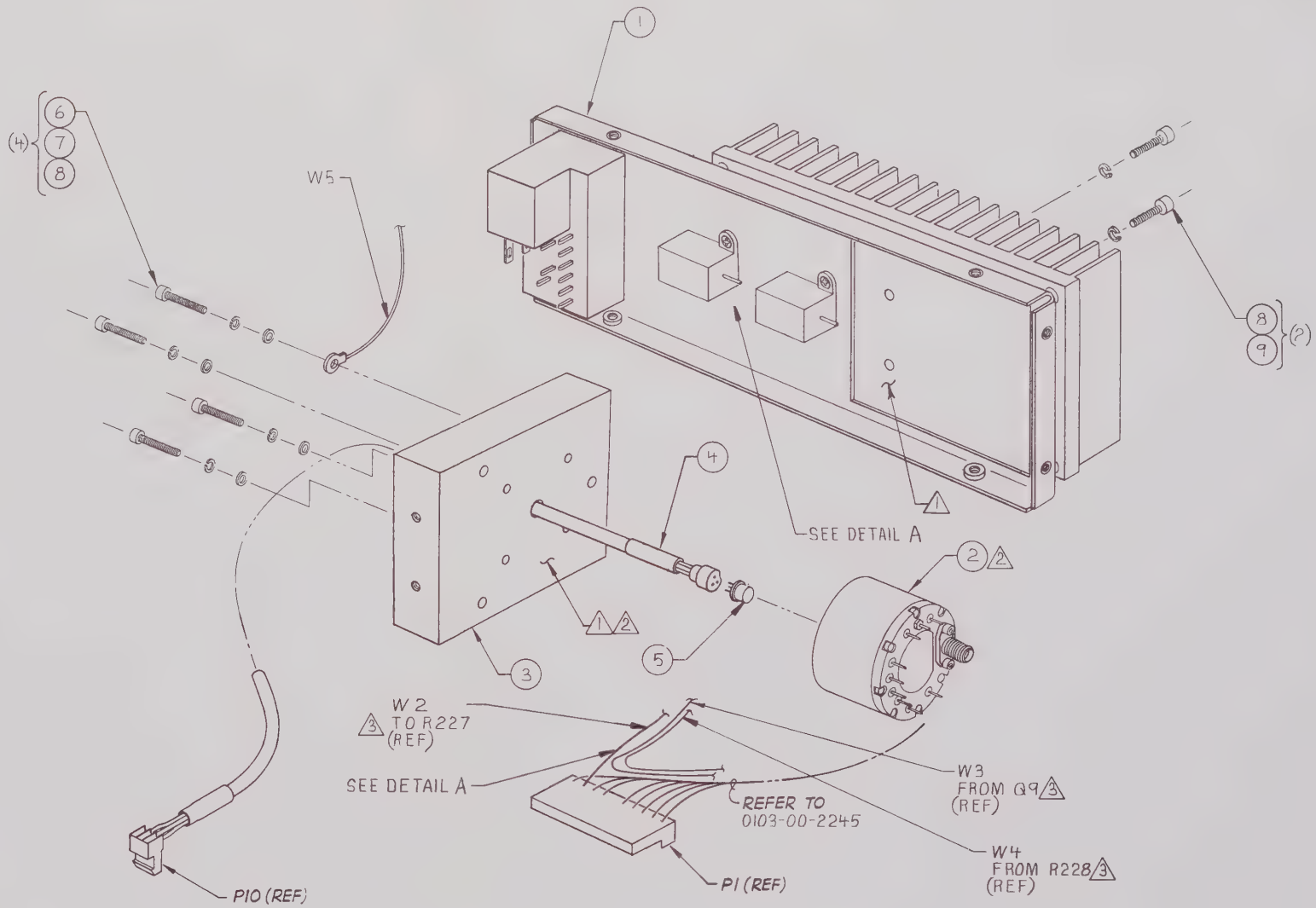
REV	ECN	BY	DATE	APP



DETAIL A



SCHEMATIC DETAIL A



4 REMOVE JUMPER WIRE W6.

3 ROUTE JUMPER WIRES W2, W3 & W4 WITH P1 WIRING TO OSCILLATOR.

2 NOTE ORIENTATION OF MOUNTING BLOCK AND OSCILLATOR.

1 USE THERMAL COMPOUND, DOW CORNING 340, OR EQUIV, AS REQUIRED BETWEEN MATING SURFACES.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 6/3/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJENGR [illegible]	7/85	TITLE ASSY, REAR PANEL
FINISH WAVETEK PROCESS —	[illegible] 7/25/85	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ±1° XX ± .030	
		DO NOT SCALE DWG	MODEL NO 965
		SCALE NONE	DWG NO 0102-00-2235 REV A
		CODE IDENT 23338	SHEET / OF /

BISHOP GRAPHICS/ACCUPRESS REORDER NO A-3091

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY REASON EXCEPT CALIBRATION, OPERATION, AND MAINTENANCE WITHOUT WRITTEN AUTHORIZATION

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REAR PANEL	0102-00-2235	WVTK	0102-00-2235	1
NONE	OSCILLATOR AND REAR PANEL SCHEMATIC	965-2245	WVTK	0103-00-2245	1
4	ASSY DRWG, THERMAL SENSOR	0102-00-1181	WVTK	0102-00-1181	1
4	SOCKET, TRANS 3PIN	027-6700-00-239	SLTRO	2100-03-0071	1
4	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1
2	OSCILLATOR AND REAR PANEL SCHEMATIC	965-2245	WVTK	0103-00-2245	1
2	ASSY, OSC CABLE	904-1047	WVTK	1207-00-1047	1
2	YIG OSCILLATOR 965	MS00712-250-XX	MICRS	2300-99-0022	1
1	ASSY DRWG, REAR PANEL	0102-00-2242	WVTK	0102-00-2242	1
1	ASSY, REAR PANEL	952-1325	WVTK	1206-00-1325	1
1	ASSY, CABLES & WIRES	1207-00-2237	WVTK	1207-00-2237	1
1	INSULATOR, PWR SWITCH REF: 1600-99-0001	801-8370	WVTK	1400-00-8370	1
1	REAR HEATSINK REF: 3200-06-0002	957A-7283	WVTK	1400-01-7283	1
1	SHIELD, AC LINE	957A-7711	WVTK	1400-01-7711	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, REAR PANEL	1101-00-2235	
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	6				
1	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
1	RES, WW, 5W, 1%, 10	RE60G10R0	DALE	4702-65-0100	1
1	TRANS	TIP-30	TI	4902-00-0300	1
1	SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1
1	IC	LM317T	NSC	7000-03-1700	1
1	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1
3	OSCI. MOUNTING BLOCK	957A-7440	WVTK	1400-01-7440	1
8	LOCKWASHER REG STAINLESS #6	MS 35338-136	CMRCL	2800-45-6000	6
7	WASHER, FLAT, S/S, #6	#6 WASHER STN	CMRCL	2800-46-6000	4
9	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2
6	SCREW, CAP, SOCKET HD, 6-32X3/4	6-32X3/4 18-8 S/S	CMRCL	2800-49-6112	4
5	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, REAR PANEL	1101-00-2235	
		PAGE 3	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	SILKSCREEN, COVER PLATE, BNC	1400-01-9990	WVTK	1400-01-9990	1
1	BNC CONN	KC-7946	KING	2100-01-0002	1
1	RECEPTACLE	6J4	CORCM	2100-03-0048	1
1	SOLDER LUG	1497	SMITH	2100-04-0012	1
1	FUSE, 1A, 250V, S-B	MDL 1	BUSS	2400-05-0029	1
1	WASHER	B51547F015	MOT	2800-11-0015	1
1	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	1
1	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-3	COML	2800-38-2104	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	1
1	SCREW, PAN, CAD I CROSS RECESS,	6-32 X 5/8 PAN	CMRCL	2800-38-6110	1
1	LOCKWASHER, #2 SPLIT BIN 525	#2SRLW	CMRCL	2800-42-2000	1
1	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
1	WASHER, SPLIT LOCK #6	#6SRLW	CMRCL	2800-42-6000	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, REAR PANEL	1101-00-2235	
		PAGE 2	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 965 / DWG NO 1101-00-2235 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A2*000

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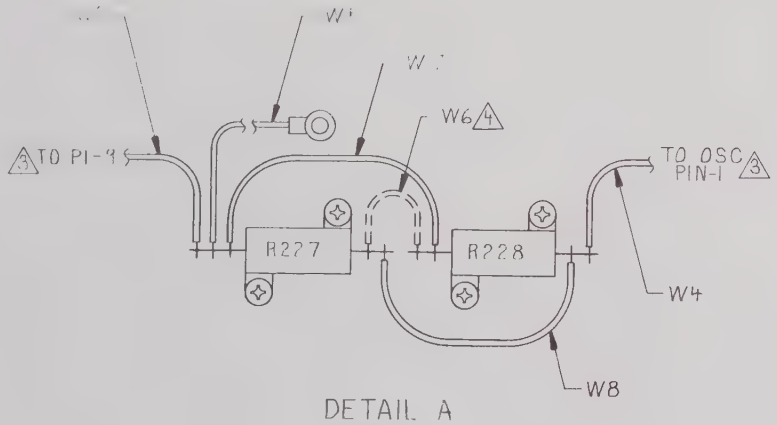
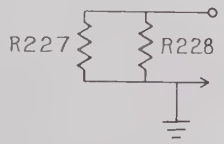
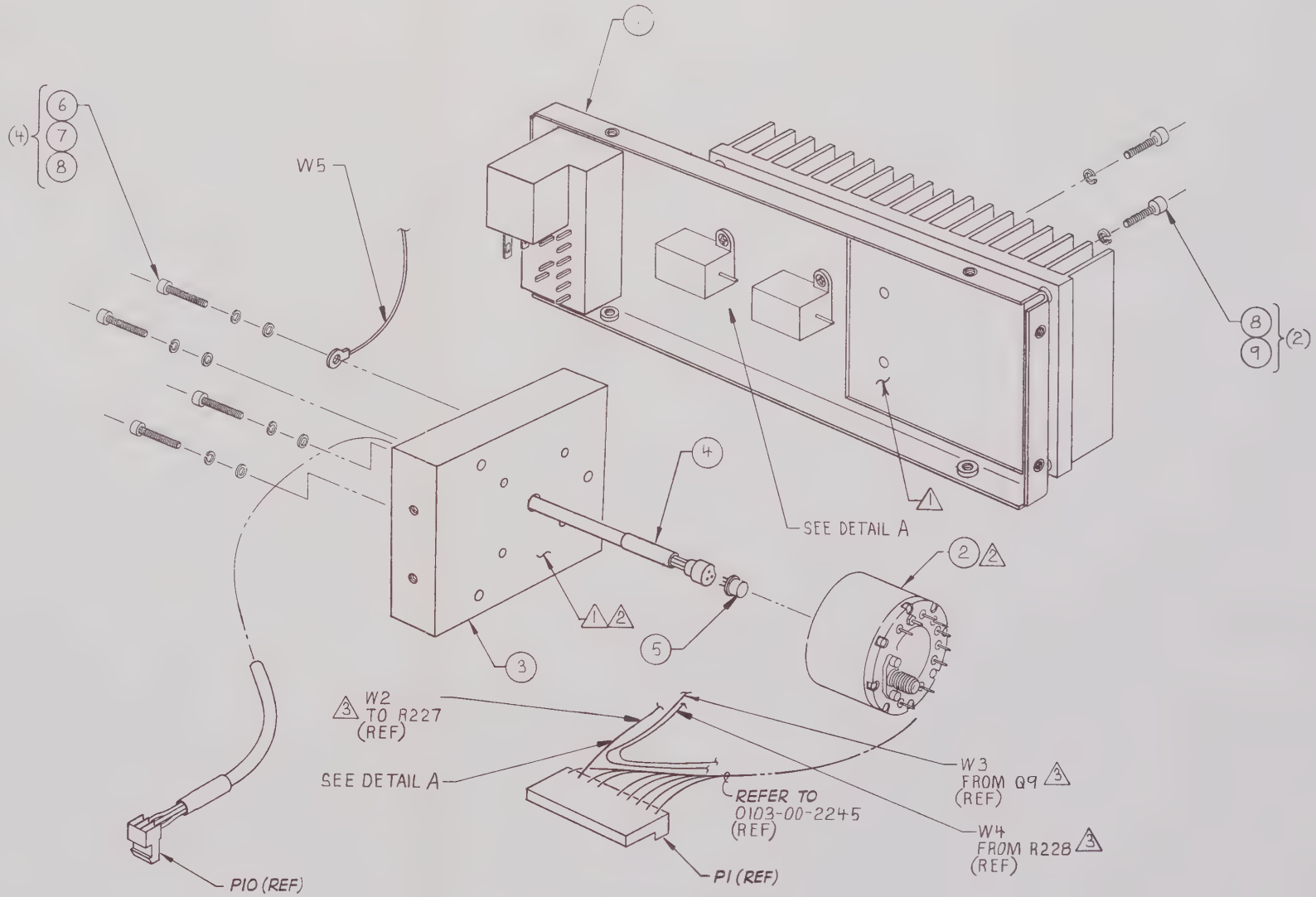
REV	ECN	BY	DATE	APP
				AS



DETAIL A



SCHEMATIC DETAIL A



4 REMOVE JUMPER WIRE W6.

3 ROUTE JUMPER WIRES W2, W3 & W4 WITH P1 WIRING TO OSCILLATOR.

2 NOTE ORIENTATION OF MOUNTING BLOCK AND OSCILLATOR.

1 USE THERMAL COMPOUND, DOW CORNING 340, OR EQUIV., AS REQUIRED BETWEEN MATING SURFACES.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 6/3/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJ ENGR C. Stark	7/8/85	TITLE ASSY, REAR PANEL
FINISH WAVETEK PROCESS —	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		
	SCALE NONE	MODEL NO 967	DWG NO 0102-00-2236 REV A
	CODE IDENT 23338	SHEET OF	

BISHOP GRAPHICS/ACCUPRESS REORDER NO A-3004

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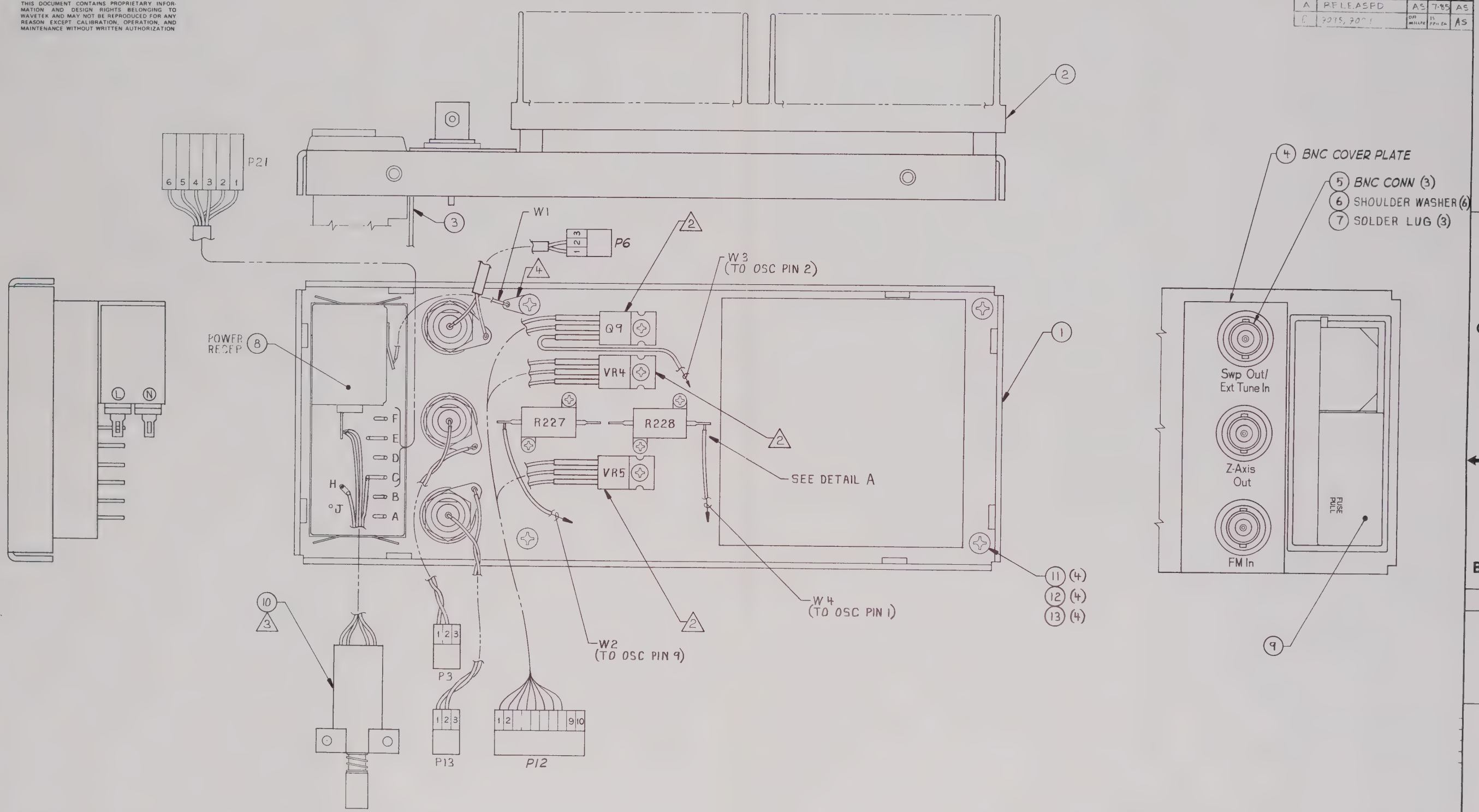
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	7275, 7291	DM MILLER	11 FEB 86	AS



SEE CONNECTION TABLE.
SEE DETAIL "D".
SEE DETAIL "C".
1. REFERENCE P/L 1207-00-2237 (CABLE & WIRE KIT)

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L QUIJENCIO	DATE 5/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Al Shultz	7/85	TITLE SUB-ASSY, REAR PANEL
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 960 SERIES	DWG NO 0102-00-2242 REV B
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

BISHOP GRAPHICS/ACCURITE RECORD NO. A7386

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REAR PANEL	0102-00-2236	WVTK	0102-00-2236	1
NONE	OSCILLATOR AND REAR PANEL SCHEMATIC	965-2245	WVTK	0103-00-2245	1
4	ASSY DRWG, THERMAL SENSOR	0102-00-1181	WVTK	0102-00-1181	1
4	SOCKET, TRANS 3PIN	027-6700-00-239	BLTRO	2100-03-0071	1
4	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1
2	OSCILLATOR AND REAR PANEL SCHEMATIC	965-2245	WVTK	0103-00-2245	1
2	ASSY, OSC CABLE	904-1047	WVTK	1207-00-1047	1
2	YIG OSCILLATOR 967	MS01218-250-XX	MICRS	2300-99-0023	1
1	ASSY DRWG, REAR PANEL	0102-00-2242	WVTK	0102-00-2242	1
1	ASSY, REAR PANEL	952-1325	WVTK	1206-00-1325	1
1	ASSY, CABLES & WIRES	1207-00-2237	WVTK	1207-00-2237	1
1	INSULATOR, PWR SWITCH REF: 1600-99-0001	B01-8370	WVTK	1400-00-8370	1
1	REAR HEATSINK REF: 3200-06-0002	957A-7283	WVTK	1400-01-7283	1
1	SHIELD, AC LINE	957A-7711	WVTK	1400-01-7711	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2236 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	6				
1	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	1
1	RES, WW, 5W, 1%, 10	RE60G10R0	DALE	4702-65-0100	1
1	TRANS	TIP-30	TI	4902-00-0300	1
1	SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1
1	IC	LM317T	NSC	7000-03-1700	1
1	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1
3	OSCI. MOUNTING BLOCK	957A-7440	WVTK	1400-01-7440	1
8	LOCKWASHER REG STAINLESS #6	MS 35338-136	CMRCL	2800-45-6000	6
7	WASHER, FLAT, S/S, #6	#6 WASHER STN	CMRCL	2800-46-6000	4
9	SCREW, CAP, SOCKET HD, 6-32X1/2	2800-49-6108	CMRCL	2800-49-6108	2
6	SCREW, CAP, SOCKET HD, 6-32X3/4	6-32X3/4 18-8 S/S	CMRCL	2800-49-6112	4
5	IC, TEMP TRANSDUCER	AD590	ANDEV	7000-05-9000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2236 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	SILKSCREEN, COVER PLATE, BNC	1400-01-9990	WVTK	1400-01-9990	1
1	BNC CONN	KC-7946	KING	2100-01-0002	1
1	RECEPTACLE	6J4	CORCM	2100-03-0048	1
1	SOLDER LUG	1497	SMITH	2100-04-0012	1
1	FUSE, 1A, 250V, S-B	MDL 1	BUSS	2400-05-0029	1
1	WASHER	B51547F015	MOT	2800-11-0015	1
1	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	1
1	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-3	COML	2800-38-2104	1
1	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	1
1	SCREW, PAN, CAD I CROSS RECESS,	6-32 X 5/8 PAN	CMRCL	2800-38-6110	1
1	LOCKWASHER, #2 SPLIT BIN 525	#2SRLW	CMRCL	2800-42-2000	1
1	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	1
1	WASHER, SPLIT LOCK #6	#6SRLW	CMRCL	2800-42-6000	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1101-00-2236 | REV

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 967 / DWG NO 1101-00-2236 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

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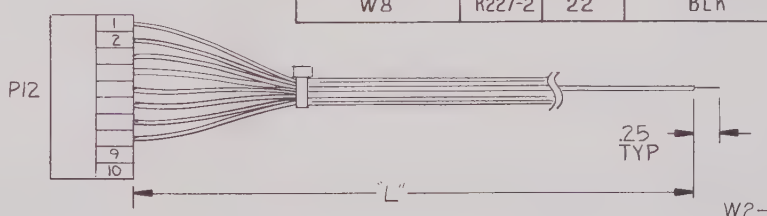
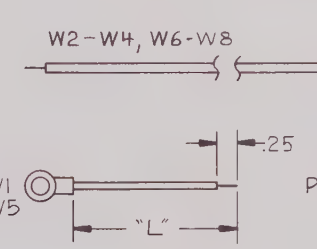
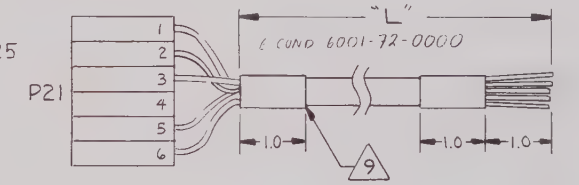
REV	ECN	BY	DATE	APP

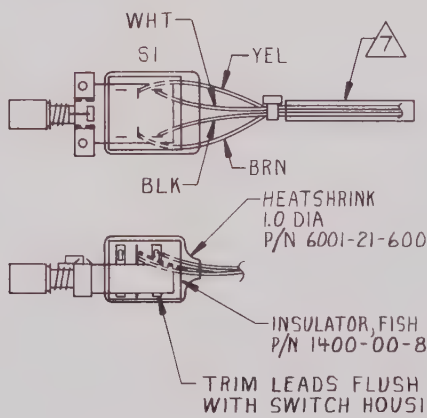
DESIGNATOR	PIN	DESTINATION	NOTE	COLOR	"L"
1207-00-2327	1	Q9 PIN 2	SEE DETAIL C	BRN	4.0
	2	VR4 PIN 2		RED	4.0
	3	Q9 PIN 1		ORG	3.75
	4	VR4 PIN 1		YEL	3.75
P12	5	VR4 PIN 3		GRN	3.5
	6	VR5 PIN 1		BLU	3.5
	7	VR5 PIN 2		VIO	3.5
	8	VR5 PIN 3	SEE DETAIL C	GRA	3.5
	9	——		N/C	—
	10	——		N/C	—
1207-00-2734	1	BNC CENTER		BRN	3.0
P3	2	BNC LUG		RED	3.0
	3	——		N/C	—
1207-00-2735	1	BNC CENTER		BRN	2.0
P13	2	BNC LUG		RED	2.0
	3	——		N/C	—
1207-00-2736	1	CORCOM PIN C		BLK	11.0
	2	E		RED	11.0
(5) P21	3	CORCOM PIN D		ORG	11.0
	4	——	POLARIZING KEY	N/C	—
	5	CORCOM PIN F		GRN	11.0
	6	E		BLU	11.0
1207-00-2338	1	N	SEE DETAIL B	WHT	4.0
(5) S1	2	L		BLK	4.0
	P1	H		YEL	4.0
	P2	CORCOM PIN C	SEE DETAIL B	BRN	4.0
1207-00-2737	1	BNC CENTER	COAX	CLEAR	11.0
P6	2	BNC LUG	PIGTAIL	ORG	11.0
	3	——		N/C	—
(5)(8) W1	—	PWR RECEPT GND LUG	18 AWG TO CHS GND	GN/YL	2.0
W5	—	R227	TO OSC MTG BLK	BLK	4.0

DESIGNATOR	PIN	GA.	COLOR	LENGTH	DESTINATION	NOTE
W2	R227-1	22	WHT	3.0	P1-9	(OSC)
W3	Q9-3	22	RED	11.0	OSC TUNE −	(PIN 2)
W4	R228-2	22	BRN	13.5	OSC TUNE +	(PIN 1)
W6	R227-2	22	BLK	0.5	R228-1	
W7	R227-1	22	BLK	1.5	R228-1	
W8	R227-2	22	BLK	1.5	R228-2	

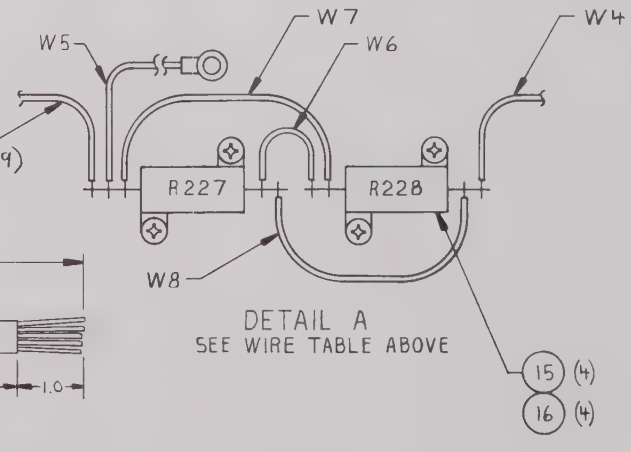




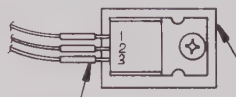


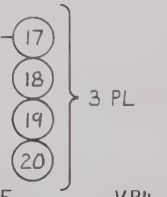


DETAIL B

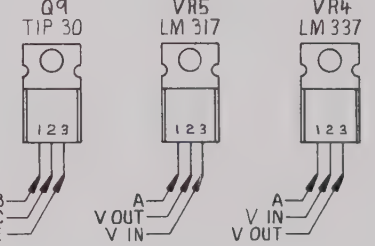


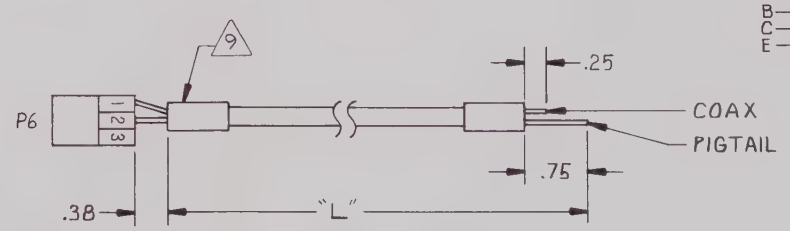
DETAIL A
SEE WIRE TABLE ABOVE





DETAIL C





(9) COVER WITH HEATSHRINK, BOTH ENDS.

(8) ALL WIRE TO BE 22 AWG EXCEPT AS NOTED.

(7) CABLING S1 TO BE COVERED WITH BLACK SLEEVING (1/4 DIA) NO.4.

6. HOOK-UP WIRE TO MEET OR EXCEED UL STYLE 1429.

(5) WIRE TO MEET OR EXCEED UL STYLE 1061.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 6/3/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL ——	PROJ ENGR Al Stark	7/85	TITLE SUB-ASSY, REAR PANEL
FINISH WAVETEK PROCESS ——	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 960 SERIES
	SCALE ——		DWG NO 0102-00-2242 REV B
			CODE IDENT 23338 SHEET 2 OF 2

BISHOP GRAPHICS-ACCUPRESS REORDER NO. A27086

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REAR PANEL	0102-00-2242	WVTK	0102-00-2242	1
1	REAR PANEL	952-7370	WVTK	1400-01-7370	1
1	SPACER,SWAGE 250 H, 250 DIA	6310-4-2C	LYNTR	2800-04-0002	1
1	NUT,PRESS	S-632-2	PEM	2800-12-0012	1
1	NUT,PRESS	S-440-2	PEM	2800-16-0011	1
1	PRESS NUT,2-56	S-256-0	PEM	2800-16-0017	1
NONE	ASSY, CABLES & WIRES	1207-00-2237	WVTK	1207-00-2237	1
NONE	INSULATOR,PWR SWITCH REF 1600-99-0001	801-8370	WVTK	1400-00-8370	1
2	REAR HEATSINK REF 3200-06-0002	957A-7283	WVTK	1400-01-7283	1
3	SHIELD, AC LINE	957A-7711	WVTK	1400-01-7711	1
4	SILKSCREEN, COVER PLATE, BNC	1400-01-9990	WVTK	1400-01-9990	1
5	BNC CONN	KC-7946	KINQ	2100-01-0002	3
8	RECEPTACLE	6J4	CDRCM	2100-03-0048	1
7	SOLDER LUG	1497	SMITH	2100-04-0012	3
9	FUSE,1A,250V,S-B	MDL 1	BUSS	2400-05-0029	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1206-00-2242 | REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
VR5	IC	LM317T	NSC	7000-03-1700	1
VR4	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1206-00-2242 | REV

PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
19	WASHER	B51547F015	MOT	2800-11-0015	3
13	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	4
6	WASHER,SHOULDER	2668	SMITH	2800-27-0004	6
15	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-3	COML	2800-38-2104	4
18	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	3
11	SCREW, PAN, CAD I CROSS RECESS,	6-32 X 5/8 PAN	CMRCL	2800-38-6110	4
16	LOCKWASHER,#2 SPLIT BIN 525	#2SRLW	CMRCL	2800-42-2000	4
20	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	3
12	WASHER,SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	4
17	INSULATOR(TO-220)	60-11-8302-1674	CHOMR	3100-00-0010	3
R227 R228	RES,WW,5W,1%,10	RE60G10R0	DALE	4702-65-0100	2
Q9	TRANS	TIP-30	TI	4902-00-0300	1
10	SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1

WAVETEK PARTS LIST | TITLE: ASSY, REAR PANEL | ASSEMBLY NO. 1206-00-2242 | REV

PAGE 2

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 962 / DWG NO 1206-00-2242 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

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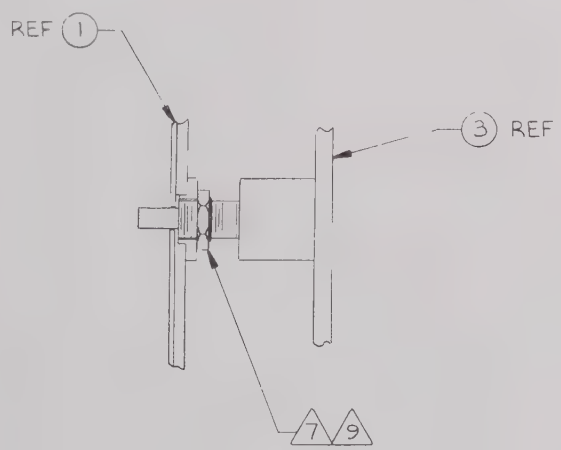
REV	DESCRIPTION	BY	DATE	APP
A	RELEASED	AC	5/8/85	AS
B	ADDED	AC	10/8/85	AS



DETAIL 'A'

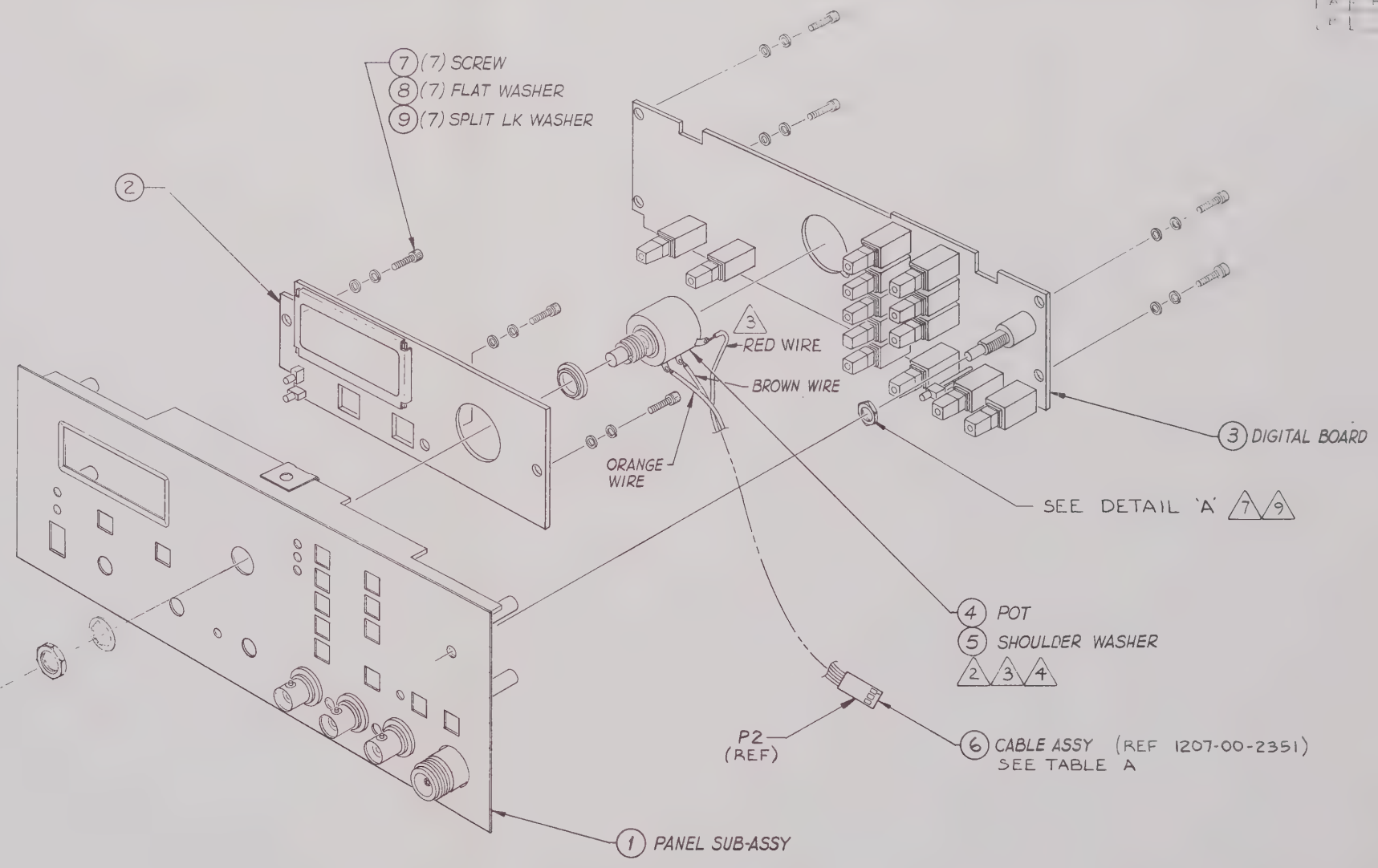


TABLE A			
P2	COLOR	LENGTH	POT
1	BRN	7.5	1
2	RED	"	2
3	ORG	"	3

1. INSTALL ITEM 2, DISPLAY BOARD ONTO ITEM 1, PANEL SUB-ASSEMBLY.
2. SOLDER ITEM 6, WIRE ASSEMBLY TO ITEM 4, POT.
3. ON ITEM 4, POT, BEND PIN 2 AND LOOP RED WIRE AS SHOWN.
4. INSTALL POT ONTO ITEM 1, WITH SHOULDER WASHER AND MOUNTING HARDWARE AS SHOWN.
5. POSITION POT TO PERMIT PIN 2 AND RED WIRE LOOP TO PROTRUDE THROUGH NOTCH IN ITEM 3, DIGITAL BOARD.
6. DRESS WIRE ASSEMBLY, ITEM 6, DOWN BETWEEN ITEM 2, DISPLAY BOARD AND ITEM 3, DIGITAL BOARD.
7. PLACE PANEL NUT ON POT BUSHING AS INDICATED.
8. INSTALL ITEM 3, DIGITAL BOARD.
9. AFTER STEP 8, TIGHTEN NUT AGAINST SUB-PANEL, ADD LOCTITE.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L.QUIJENCIO	DATE 3/29/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL //	PROJ ENGR [illegible]	5/7/85	TITLE ASSY, FRONT PANEL
FINISH WAVETEK PROCESS //	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 960 SERIES
	SCALE NONE		DWG NO 0102-00-2209 REV B
			CODE IDENT 23338 SHEET 1 OF 1

0102-00-2209

BISHOP GRAPHICS-ACCUPRESS REORDER NO. A27086

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, FRONT PANEL	0102-00-2209	WVTK	0102-00-2209	1
1	FRONT PANEL SUB-ASSY, 962	962-2215	WVTK	1206-00-2215	1
P2	ASSY DRWG, FRONT PANEL	0102-00-2209	WVTK	0102-00-2209	1
P2	HOUSING, CONN 3-POS	87499-3	AMP	2100-03-0042	1
P2	WIRE, HU, 22GA	H0101029 (BRN)	JUDD	6000-32-2001	1
P2	WIRE, HU, 22GA	H0101029 (RED)	JUDD	6000-32-2002	1
P2	WIRE, HU, 22GA	H0101029 (ORN)	JUDD	6000-32-2003	1
2	ASSY DRWG, DISPLAY BD	0101-00-1851	WVTK	0101-00-1851	1
2	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
2	CAP, MICA, 100PF, 500V	DM15-101J	ARCO	1500-11-0100	1
2	CAP, POLYE, .22MF, 80V	192P2249R8	SPRAG	1500-42-2403	1
2	DRILL DRWG, DISPLAY BD	1700-00-1851	WVTK	1700-00-1851	1
2	CONN HEADER, SIP, 8 PIN	AMP	87465-1	2100-02-0165	1
2	SKT, IC, 40PIN	DILB-40P-108	BURND	2100-03-0030	1

WAVETEK PARTS LIST | TITLE: ASSY, FRONT PANEL, 962 | ASSEMBLY NO. 1101-00-2209 | REV | PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
2	DISPLAY, LIQUID CRYS	739A-3-5	BECK	2400-03-0006	1
2	ZEBRA STRIP	LQ TYPE-2L-.8W-.9H	CRT	2400-03-0014	1
2	BEZEL, BLACK CHROMATE	120-200-13	CRT	2400-08-0002	1
2	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
2	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
2	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
2	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
2	RES, MF, 1/8W, 1%, 499K	RN55D-4993F	TRW	4701-03-4993	1
2	RES, MF, 1/8W, 1%, 750	RN55D-7500F	TRW	4701-03-7500	1
2	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
2	LED, RED	LN230RP	PANAS	4899-00-0042	1
2	LED, GREEN	LN3309P	PANAS	4899-00-0043	1
2	TRANS	2N3906	FAIR	4901-03-9060	1
2	IC	ICL7106CPL	INTSL	8000-71-0600	1
NONE	ASSY DRWG, DIGITAL BD	0101-00-1857	WVTK	0101-00-1857	1
NONE	ASSY, 3 CONDUCTOR CABLE	960-SERIES-2349	WVTK	1207-00-2349	1

WAVETEK PARTS LIST | TITLE: ASSY, FRONT PANEL, 962 | ASSEMBLY NO. 1101-00-2209 | REV | PAGE 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	SWITCH CAP, PLAIN, LIGHT GRAY	960-0120		1400-02-0120	1
NONE	CAP, CER, MN, .01MF, 50V	GE50-103ZA	MURAT	1500-01-0310	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, TANT, 1MF, 35V	150D105X9035A2	SPRAG	1500-71-0502	1
NONE	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	DRILL DRWG, DIGITAL BD.	1700-00-1857	WVTK	1700-00-1857	1
NONE	CONN, RCPT, SIP, 8 PIN	66950-008	BERG	2100-02-0164	1
NONE	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	1
NONE	S: PB SPST N.O. (LIGHTED)	39-22100	LICON	341.1104	1
NONE	KNOB: PB SQ GRY LIGHTED 3830			370.0763	1
NONE	LIGHT PIPE: PUSHBUTTON SWITCH			371.2951	1
NONE	POT, RF, 10K	SPPN040P103U	AB	4600-01-0325	1
NONE	POT, TRIM, 20T, 1K	68XR1K	BECK	4609-90-0015	1
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1

WAVETEK PARTS LIST | TITLE: ASSY, FRONT PANEL, 962 | ASSEMBLY NO. 1101-00-2209 | REV | PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
NONE	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
NONE	RES, MF, 1/8W, 1%, 1.62K	RN55D-1621F	TRW	4701-03-1621	1
NONE	RES, MF, 1/8W, 1%, 18.2K	RN55D-1822F	TRW	4701-03-1822	1
NONE	RES, MF, 1/8W, 1%, 23.7K	RN55D-2372F	TRW	4701-03-2372	1
NONE	RES, MF, 1/8W, 1%, 40.2K	RN55D-4022F	TRW	4701-03-4022	1
NONE	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
NONE	RES, MF, 1/8W, 1%, 5.76K	RN55D-5761F	TRW	4701-03-5761	1
NONE	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	1
NONE	RES, MF, 1/8W, 1%, 8.87K	RN55D-8871F	TRW	4701-03-8871	1
NONE	RES MODULE, 10K	4310R-101-103	BOURN	4770-00-0008	1
NONE	RES MODULE	4310R-101-471	BOURN	4770-00-0009	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	LED, RED	LN230RP	PANAS	4899-00-0042	1
NONE	LED	LTL-4222	LITON	4899-00-0044	1
NONE	CABLE, FLAT, FLEX, 26 PIN 2.5 INCHES	2-86942-5	AMP	6001-60-0015	1

WAVETEK PARTS LIST | TITLE: ASSY, FRONT PANEL, 962 | ASSEMBLY NO. 1101-00-2209 | REV | PAGE 4

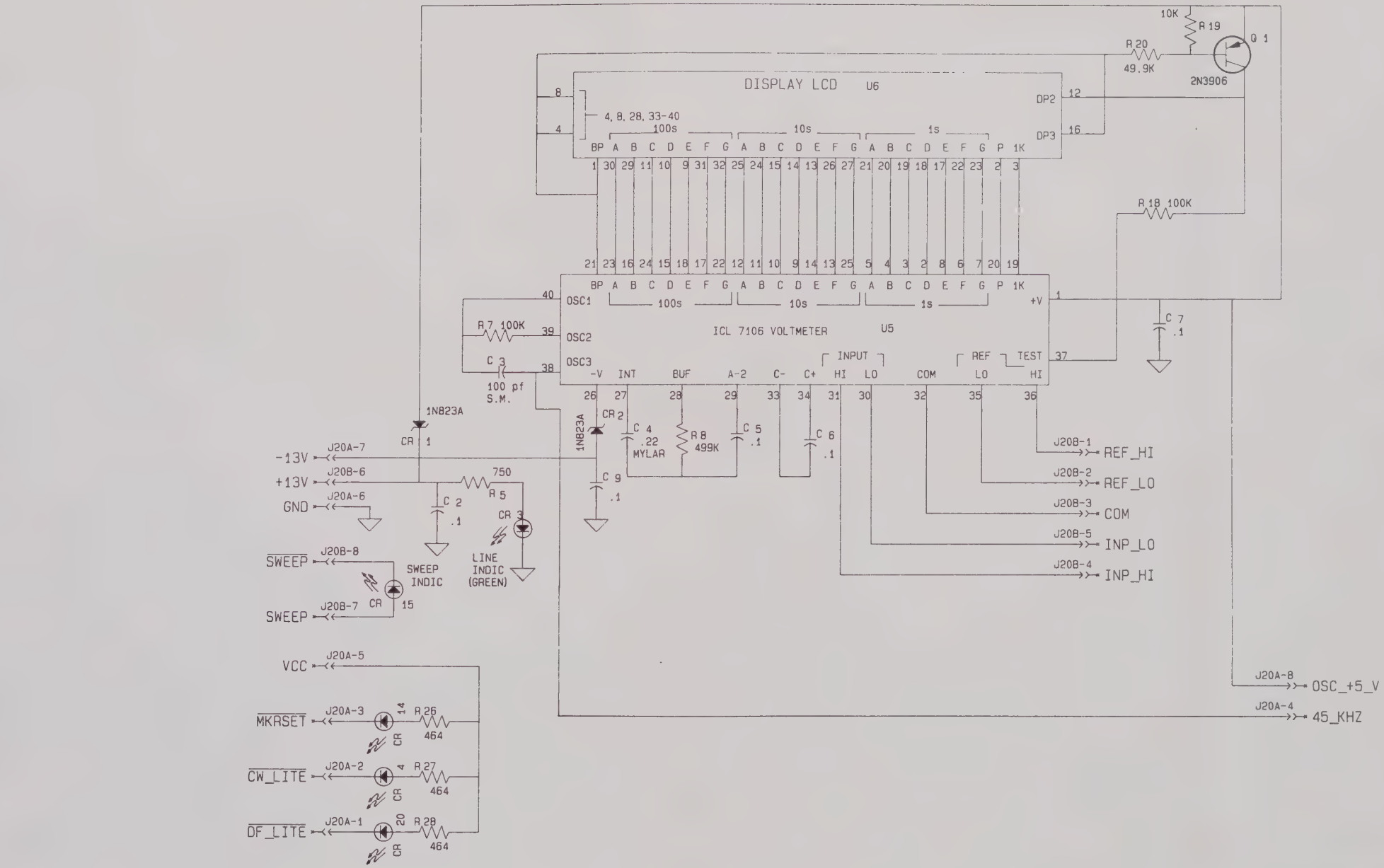
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC	LM555CN	NSC	7000-05-5500	1
NONE	IC	4017	FAIR	8000-40-1700	1
NONE	IC, PROGRAMMED REF: 8000-16-6401	8600-00-0330	WVTK	8600-00-0330	1
NONE	IC, PROGRAMMED REF: 8000-16-8400	8600-00-0331	WVTK	8600-00-0331	1
NONE	IC, PROGRAMMED REF: 8000-16-6401	8600-00-0332	WVTK	8600-00-0332	1
8	WASHER, FLAT, #6 BIN 495	#6FLAT WASHER	CMRCL	2800-26-6001	7
5	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
7	SCREW, FILL, CAD I, CROSS RECESS, 6-32X5/16	6-32X5/16 FILL	CMRCL	2800-39-6105	7
9	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	7
4	FREQUENCY POT, MOD	4609-71-0322	WVTK	4609-71-0322	1
3	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1

WAVETEK PARTS LIST | TITLE: ASSY, FRONT PANEL, 962 | ASSEMBLY NO. 1101-00-2209 | REV | PAGE 5

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST ASSY, FRONT PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO. 962 / DWG NO. 1101-00-2209 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET OF
	SCALE		

REV	ECN	BY	DATE	APPV
A	RELEASED	AS	7-85	AS



3. ALL DIODES ARE TYPE 1N4148
2. ALL CAPACITORS IN MICROFARADS
1. ALL RESISTORS IN OHMS, 1/8 W, 1%
NOTE: UNLESS SPECIFIED OTHERWISE

DRAWN BY C. KREHBIEL	DATE 8-5-84
PROJ ENGR [signature]	7-29-85
RELEASE APPROV [signature]	7/25/85

WAVETEK SAN DIEGO, CALIFORNIA

TITLE

DISPLAY CIRCUIT BOARD

MODEL NO.	DRAWING NUMBER	REV
960 SERIES	0103-00-1851	A
CODE IDENT 23338	SHEET 1 OF 1	

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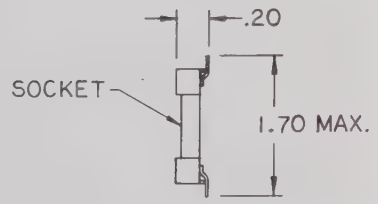
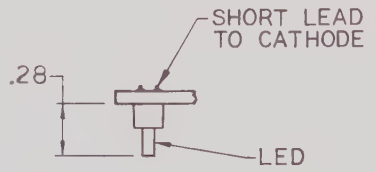
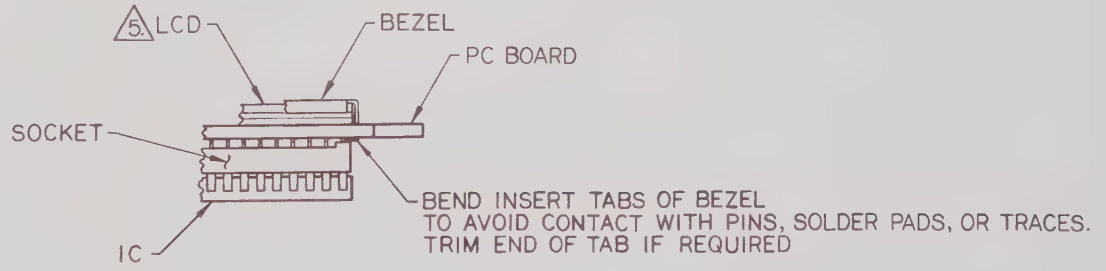
REV	ECN	BY	DATE	APP



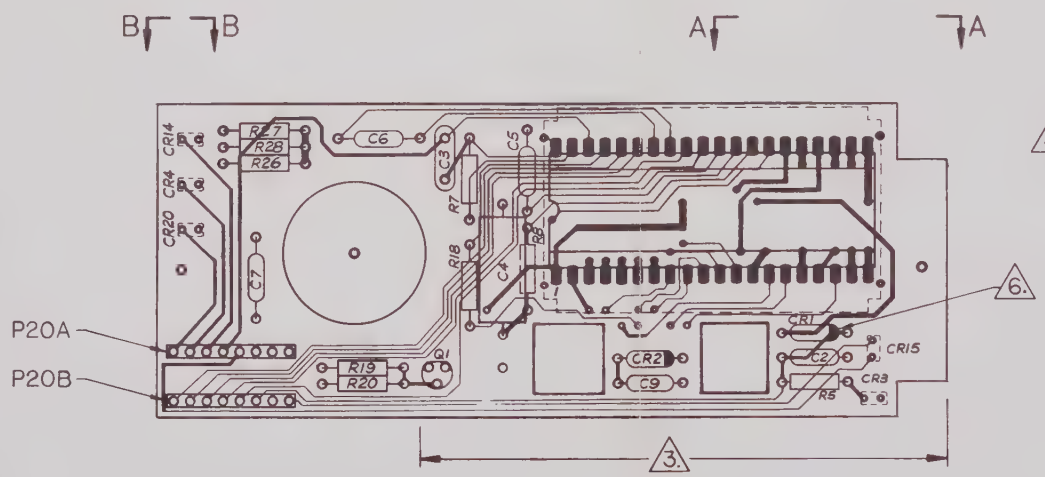
DETAIL "A"
NOTE: BEND ALL PINS 90° OUTBOARD TO POSITION SHOWN PRIOR TO SOLDERING ON COMPONENT SIDE

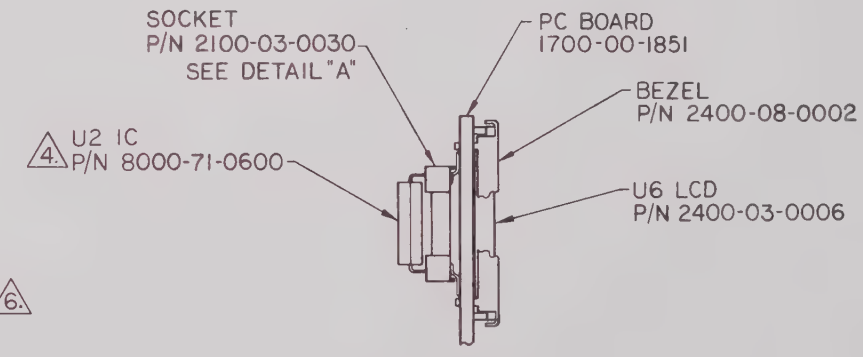


DETAIL "B"
NOTE: INSTALL LED'S FLUSH TO PCB TYP 5 PLCS

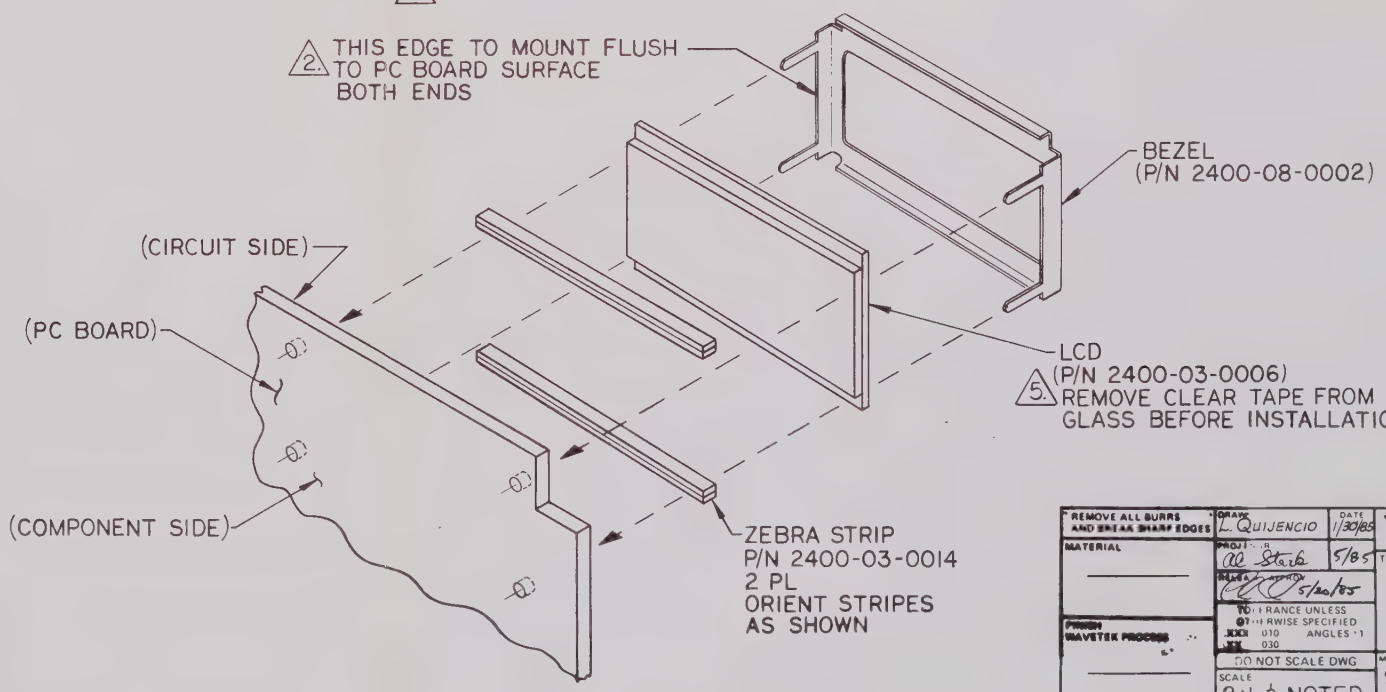

5. LCD
BEZEL
PC BOARD
SOCKET
IC
BEND INSERT TABS OF BEZEL TO AVOID CONTACT WITH PINS, SOLDER PADS, OR TRACES. TRIM END OF TAB IF REQUIRED

DETAIL A-A





OTHER COMPONENTS OMITTED FOR CLARITY



6. CRI, CR2, C2, C9, AND R5 TO HAVE 0.4 PREP.

5. OBSERVE LCD REFLECTION AND ORIENT "+" END TOWARD EDGE OF BOARD

4. HANDLE WITH STATIC-SENSITIVE PROCEDURES

3. COMPONENT SIDE OF PC BOARD, IN THIS AREA, TO BE SPRAYED WITH TWO LAYERS OF HUMI-SEAL AFTER ASSEMBLY AND PRE-TEST

2. APPLY SUFFICIENT FORCE TO PROPERLY INSTALL

1. FOR PARTS LIST SEE 120

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L. QUIJENCIO	DATE 11/30/84	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ. ENGR. [illegible]	5/85	TITLE ASSEMBLY, DISPLAY BOARD
FINISH WAVETEK PROCESS	MFG. ENGR. [illegible]	5/20/85	
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX .010 ANGLES ±1 .XX .030		
	DO NOT SCALE DWG	MODEL NO. 960 SERIES	DWG NO. 0101-00-1851 REV A
	SCALE 2:1 & NOTED	CODE IDENT 23338	SHEET 1 OF 1

0101-00-1851

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, DISPLAY BD	0101-00-1851	WVTK	0101-00-1851	1
C2 C5 C6 C7 C9	CAP,CER,MON,.1MF,50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	5
C3	CAP,MICA,100PF,500V	DM15-101J	ARCO	1500-11-0100	1
C4	CAP,POLYE,.22MF,80V	192P2249R8	SPRAG	1500-42-2403	1
NONE	DRILL DRWG, DISPLAY BD	1700-00-1851	WVTK	1700-00-1851	1
NONE P208	CONN HEADER, SIP, 8 PIN	AMP	87465-1	2100-02-0165	3
NONE	SKT,IC,40PIN	DILB-40P-108	BURND	2100-03-0030	1
U6	DISPLAY,LIQUID CRYS	739A-3-5	BECK	2400-03-0006	1
NONE	ZEBRA STRIP	LQ TYPE-2L-.8W-.9H	CRT	2400-03-0014	2
NONE	BEZEL,BLACK CHROMATE	120-200-13	CRT	2400-08-0002	1
R19	RES,MF,1/8W,1%,10K	RN55D-1002F	TRW	4701-03-1002	1
R18 R7	RES,MF,1/8W,1%,100K	RN55D-1003F	TRW	4701-03-1003	2
R26 R27 R28	RES,MF,1/8W,1%,464	RN55D-4640F	TRW	4701-03-4640	3
R20	RES,MF,1/8W,1%,49.9K	RN55D-4992F	TRW	4701-03-4992	1
R8	RES,MF,1/8W,1%,499K	RN55D-4993F	TRW	4701-03-4993	1
R5	RES,MF,1/8W,1%,750	RN55D-7500F	TRW	4701-03-7500	1

WAVETEK PARTS LIST	TITLE: DISPLAY BOARD	ASSEMBLY NO. 1208-00-1851	REV
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR1 CR2	DIODE,ZENER 6.2V	1N823A	MOT	4801-01-0823	2
CR14 CR15 CR20 CR4	LED, RED	LN230RP	PANAS	4899-00-0042	4
CR3	LED, GREEN	LN330GP	PANAS	4899-00-0043	1
Q1	TRANS	2N3906	FAIR	4901-03-9060	1
U5	IC	ICL7106CPL	INTSL	8000-71-0600	1

WAVETEK PARTS LIST	TITLE: DISPLAY BOARD	ASSEMBLY NO. 1208-00-1851	REV
		PAGE 2	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST ASSY, DISPLAY BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1		MODEL NO 960 / DWG NO 1208-00-1851 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET / OF
	SCALE		

BISHOP GRAPHICS ACCURATE REORDER NO A2106

REV	ECN	BY	DATE	APPV
A	RELEASED	AS	7-85	AS

TRUTH TABLES

MODE2	MODE1	STATE
0	0	DISP. TEST
0	1	STRT/STOP
1	0	DELTA F
1	1	CW

DM3	DM2	DM1	LCD
0	0	0	DLT F
0	0	1	M1
0	1	0	M2
0	1	1	M3
1	0	0	STOP
1	0	1	STRT
1	1	0	CF
1	1	1	CW

ON/OFF UPDATE EXTT RF EXTLEV DLT F S/S CW

VCC

S 1 S 2 S 3 S 4 S 5 S 6 S 7 S 8

C 29 .1

C31 .1, C25 .1, C20 .1, C21 .1, C24 .1, C23 .1, C22 .1

R N1 1 2 7 24 464 25 464 8 9 10

RN1 IS A SIP RES. PACK 470 OHMS, 5 PLACES

CR 5 6 7 8 9 10 11

STOP_DF START_CF

VCC VCC

R 2 464 R 18 464

CR 12 CR 13

STATCLK

SIP RES. PACK 10K, 11 PLCS

RN2 RN3

EXTUNE J4-18

BLINK (8 Hz) (SHEET 2)

LEVINDIC J4-17 LEV

CR 21

OSC_+5_V J20A-8

45_KHZ J20A-4

U4 CD4017B: COUT, Vdd, CK, INHBT, RES, Vss, Y0–Y9

C 8 .01

VCC B

U1 16A6 8600-00-0330

CK, I0 CWI, I1 S/S, I2 DF, I3 LEV, I4 RF, I5 EXTT, I6 UPDATE, I7 ANY2

R0 UPDATE, R1 LEV, R2 RF_LITE, R3 EXITO, R4 MODE1, R5 MODE2, I/01 ANYMODE, I/02 ANYIN, OE

U2 16A6 PROGRAMMED PAL 8600-00-0332

CK MKBCLK, I0 M1, I1 M2, I2 M3, I3 MODE2, I4 MODE1, I5 START/CF, I6 STOP/DF, I7 ON/OFF

R0 DM3, R1 DM2, R2 DM1, R3 M3, R4 M2, R5 M1, I/01, I/02, OE

U3 16L8 PROGRAMMED PAL 8600-00-0331

BLINK, DM3, DM2, DM1, MODE2, MODE1, EXITO, M1, M3, M2

Y0 EXTT, Y1 CW_LITE, Y2, Y3, Y4, Y5 M3O, Y6 M2O, Y7 M1O

M1 M2 M3

CR 15 CR 17 CR 18

5 6 3 RN1

SIP RESISTOR PACK 470 OHMS, 3 PLCS

J20A-2 CW_LITE

J20A-1 DF_LITE

J4-6 LEV

J4-5 AF_LITE

J4-10 S/SLITE

J20B-7 SWEEP

J4-20 EXTT

J4-2 DF_LITE

J4-3 CW_LITE

J4-11 DM3

J4-12 DM2

J4-13 DM1

J4-14 M3

J4-15 M2

J4-16 M1

J4-4 MKASET

J20A-3 MKASET

VCC BATTERY J4-26 VCC B

220/10V TANT C103

R 21 1K

M3 S 9 M2 S 10 M1 S 11

C28 .1 C27 .1 C26 .1

STOP/DF S 12 START/CF S 13

C30 .1

SIP RES PACK 10K OHMS, 2 PL

RN3

2. ALL CAPACITORS IN MICROFARADS

1. ALL RESISTORS IN OHMS, 1/8 W, 1%

NOTE: UNLESS OTHERWISE SPECIFIED

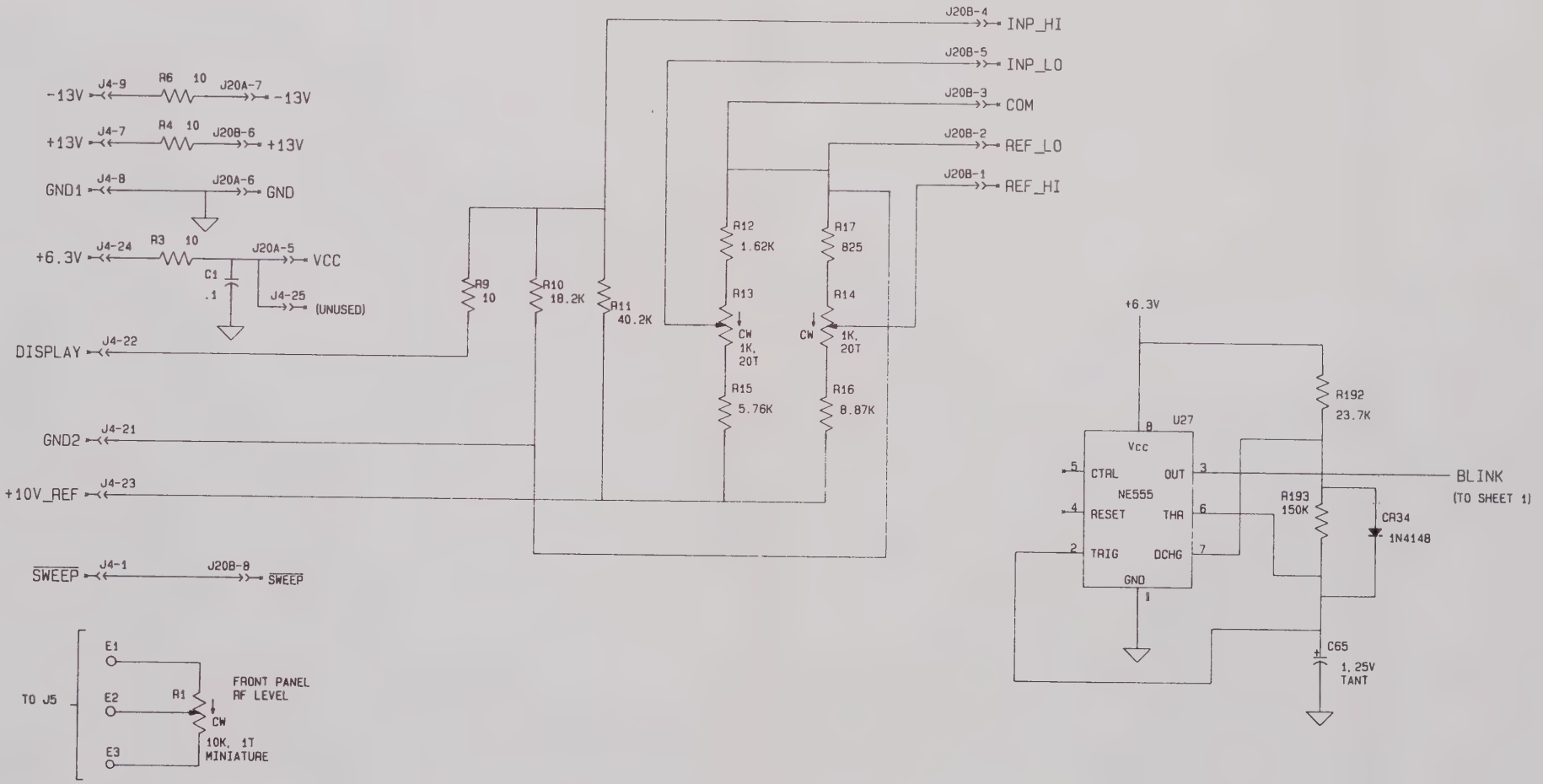
DRAWN BY	DATE
C. KREHBIEL	8-5-84
PROJ ENGR Al Stark	7-29-85
RELEASE APPROV	12/5/85

WAVETEK SAN DIEGO, CALIFORNIA

TITLE

DIGITAL CIRCUIT BOARD

MODEL NO.	DRAWING NUMBER	REV
960 SERIES	0103-00-1857	A
CODE IDENT 23338	SHEET 1 OF 2	



DRAWN BY: C. KAEHBIEL	DATE: 8-5-84	WAVETEK · SAN DIEGO, CALIFORNIA	
PROJ. ENGR: 7-29-85		TITLE: DIGITAL CIRCUIT BOARD	
RELEASE SIGNOFF: 7/25/85		MODEL NO.: 960 SERIES	DRAWING NUMBER: 0103-00-1857 REV: A
		CODE IDENT: 23338	SHEET 2 OF 2

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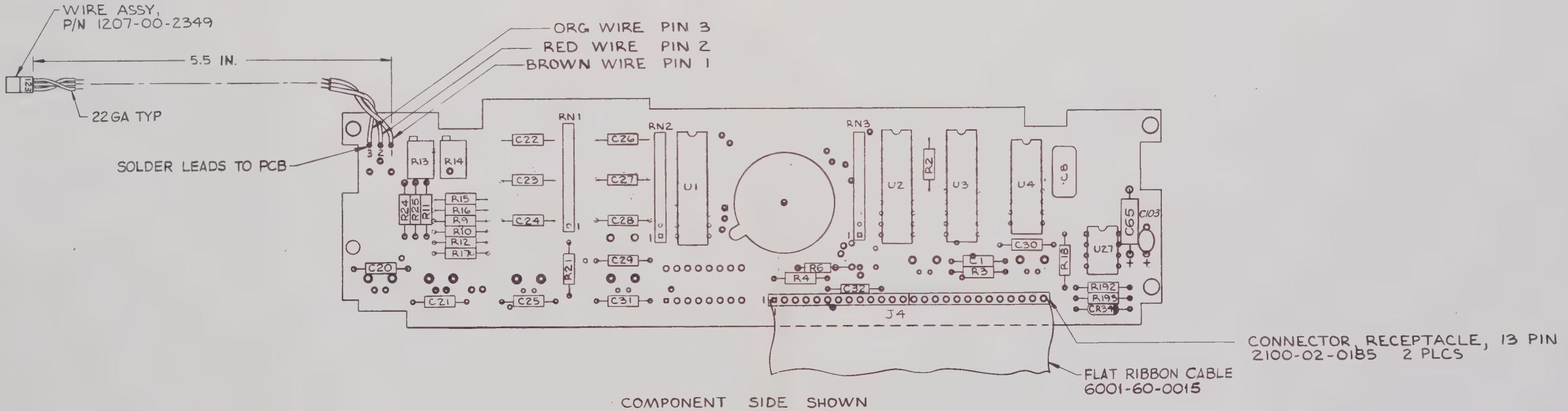
REV	ECN	BY	DATE	APP



COMPONENT SIDE SHOWN

PLS SEE SH 2

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 1-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR Al Stark	5/85	TITLE ASSEMBLY, PCB, DIGITAL CONTROL
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030	5/20/85	
	DO NOT SCALE DWG		MODEL NO 960's / DWG NO 0101-00-1857 / REV A
	SCALE 2:1		CODE IDENT 23338 / SHEET 1 OF 2

0101-00-1857 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3994

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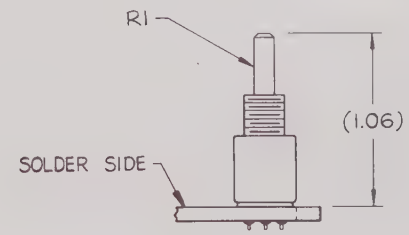
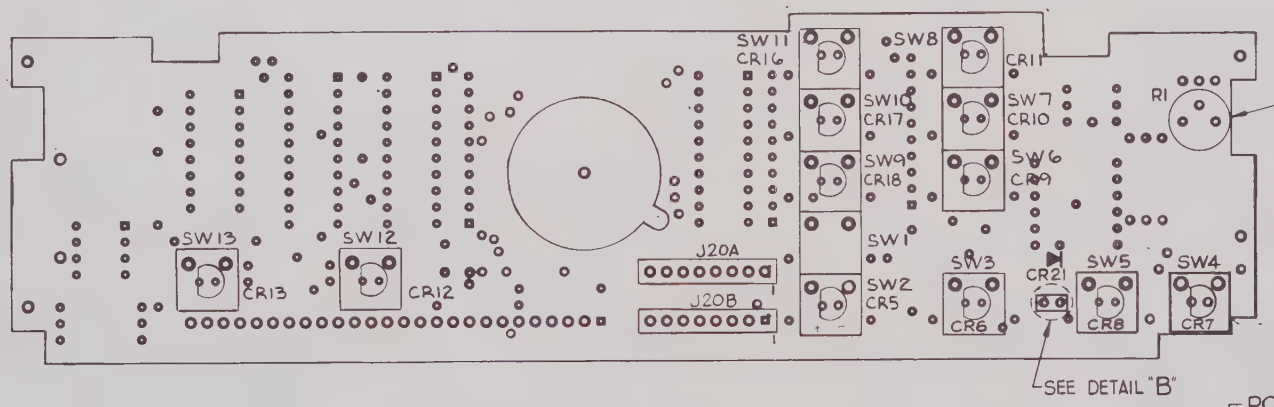
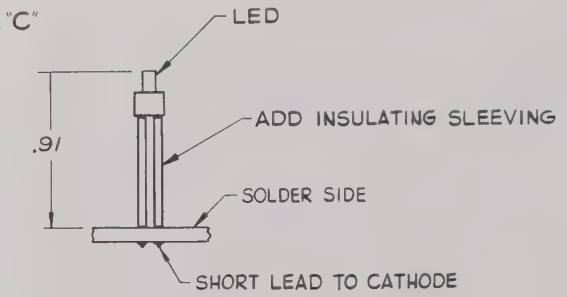
REV	ECN	BY	DATE	APP



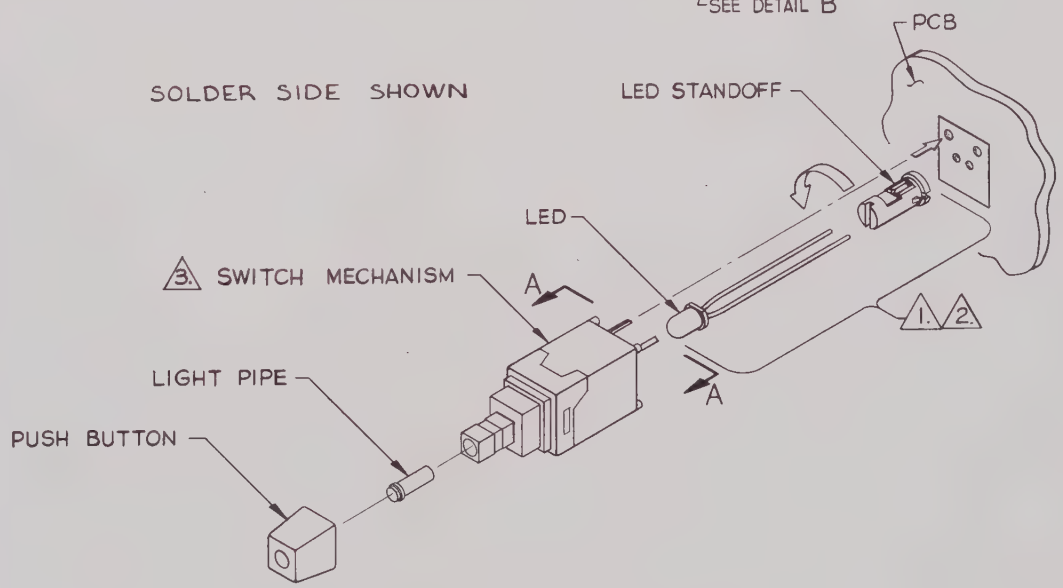
DETAIL "C"





DETAIL "B"

SOLDER SIDE SHOWN



STANDOFF INSTALLED IN POSITION AS SHOWN. SHORT LEAD OF LED TO LINE UP WITH "+" INDICATOR.

DETAIL A-A

3. USE MWBU SK1338 FIXTURE TO INSTALL SWITCHES TO PCB.

2. WHEN INSTALLING SWITCH TO PCB, LED LEADS TO BE PULLED THROUGH PCB AS FAR AS POSSIBLE BEFORE SOLDERING.

1. LED TO BE INSERTED INTO LED STANDOFF WITH FLAT SIDE OF LED ORIENTED TO "+" ON LED STANDOFF. STANDOFF IS THEN INSERTED INTO SWITCH MECHANISM AND SECURED BY 1/4 TURN CLOCKWISE ↻.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 1-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJ ENG Ole Stark	5/85	TITLE ASSEMBLY, PCB, DIGITAL CONTROL
FINISH WAVETEK PROCESS —	5/20/85		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 960's	DWG NO 0101-00-1857 REV A
	SCALE 2:1	CODE IDENT 23338	SHEET 2 OF 2

0101-00-1857

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3804

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REV	DESCRIPTION	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, DIGITAL BD	0101-00-1857	WVTK	0101-00-1857	1
NONE	ASSY DRWG, DIGITAL BD	0101-00-1857	WVTK	0101-00-1857	1
NONE	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
NONE	WIRE, HU, 22GA	H0101029 (BRN)	JUDD	6000-32-2001	1
NONE	WIRE, HU, 22GA	H0101029 (RED)	JUDD	6000-32-2002	1
NONE	WIRE, HU, 22GA	H0101029 (ORN)	JUDD	6000-32-2003	1
S1	SWITCH CAP, PLAIN, LIGHT GRAY	960-0120		1400-02-0120	1
C8	CAP, CER, MN, .01MF, 50V	0E50-103ZA	MURAT	1500-01-0310	1
C1 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	14
C65	CAP, TANT, 1MF, 35V	150D105X9035A2	SPRAG	1500-71-0502	1
C103	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	DRILL DRWG, DIGITAL BD.	1700-00-1857	WVTK	1700-00-1857	1
J20A J20B	CONN, RCPT, SIP, 8 PIN	66950-008	BERG	2100-02-0164	2
J4A J4B	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	2
S1 S10 S11 S12 S13 S2 S3 S4	S: PB SPST N.O.	39-22100	LICON	341.1104	13

WAVETEK PARTS LIST | TITLE: ASSY, DIGITAL BOARD | ASSEMBLY NO. 1208-00-1857 | REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
RN2 RN3	RES MODULE, 10K	4310R-101-103	BOURN	4770-00-0008	2
RN1	RES MODULE	4310R-101-471	BOURN	4770-00-0009	1
CR34	DIODE	1N4148	FAIR	4807-02-6666	1
CR21	LED, RED	LN230RP	PANAS	4899-00-0042	1
CR10 CR11 CR12 CR13 CR16 CR17 CR18 CR5 CR6 CR7 CR8 CR9	LED	LTL-4222	LITON	4899-00-0044	12
NONE	CABLE, FLAT, FLEX, 26 PIN 2.5 INCHES	2-86942-5	AMP	6001-60-0015	1
U27	IC	LM555CN	NSC	7000-05-5500	1
U4	IC	4017	FAIR	8000-40-1700	1
U1	IC, PROGRAMMED REF: 8000-16-6401	8600-00-0330	WVTK	8600-00-0330	1
U3	IC, PROGRAMMED REF: 8000-16-8400	8600-00-0331	WVTK	8600-00-0331	1
U2	IC, PROGRAMMED REF: 8000-16-6401	8600-00-0332	WVTK	8600-00-0332	1

WAVETEK PARTS LIST | TITLE: ASSY, DIGITAL BOARD | ASSEMBLY NO. 1208-00-1857 | REV

PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
S5 S6 S7 S8 S9	(LIGHTED)				
NONE	KNOB: PB SQ GRY LIGHTED 5830			370.0763	12
NONE	LIGHT PIPE: PUSHBUTTON SWITCH			371.2951	12
R1	POT, RF, 10K	SPPN040P103U	AB	4600-01-0325	1
R13 R14	POT, TRIM, 20T, 1K	68XR1K	BECK	4609-90-0015	2
R21	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1
R3 R4 R6 R9	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	4
R193	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
R12	RES, MF, 1/8W, 1%, 1.62K	RN55D-1621F	TRW	4701-03-1621	1
R10	RES, MF, 1/8W, 1%, 18.2K	RN55D-1822F	TRW	4701-03-1822	1
R192	RES, MF, 1/8W, 1%, 23.7K	RN55D-2372F	TRW	4701-03-2372	1
R11	RES, MF, 1/8W, 1%, 40.2K	RN55D-4022F	TRW	4701-03-4022	1
R18 R2 R24 R25	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	4
R15	RES, MF, 1/8W, 1%, 5.76K	RN55D-5761F	TRW	4701-03-5761	1
R17	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	1
R16	RES, MF, 1/8W, 1%, 8.87K	RN55D-8871F	TRW	4701-03-8871	1

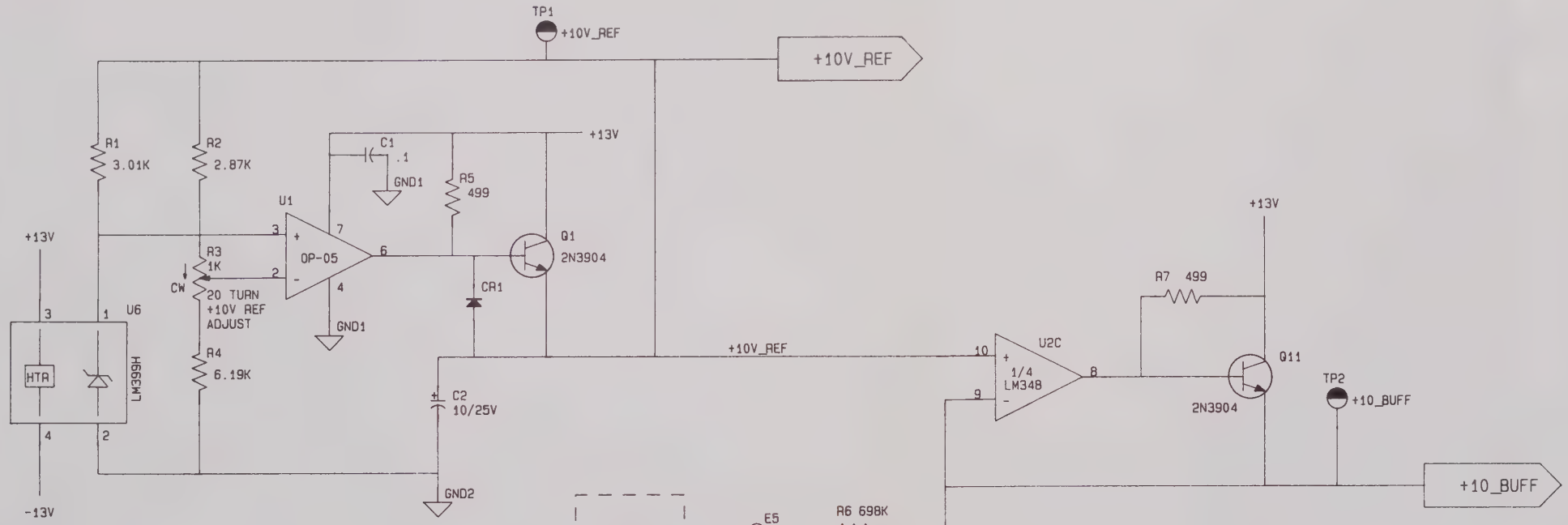
WAVETEK PARTS LIST | TITLE: ASSY, DIGITAL BOARD | ASSEMBLY NO. 1208-00-1857 | REV

PAGE 2

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST ASSY, DIGITAL BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 960 / DWG NO 1208-00-1857 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APPV
A	RELEASED	AS	7-85	AS



NOTE: BYPASS CAPACITORS ARE .1 MFD UNLESS OTHERWISE SPECIFIED. ALL CAPS TO BE LOCATED AS CLOSE AS CLOSE AS POSSIBLE TO SPECIFIED IC.

NOTE: THE INTERCONNECTIONS SHOWN ABOVE REPRESENT NODES ON THE MAIN CIRCUIT BOARD THAT WOULD OTHERWISE NOT APPEAR ON THE SCHEMATIC. REFER TO THE INTERCONNECT DIAGRAM FOR A COMPLETE DESCRIPTION OF EACH CONNECTOR'S INPUTS AND OUTPUTS.

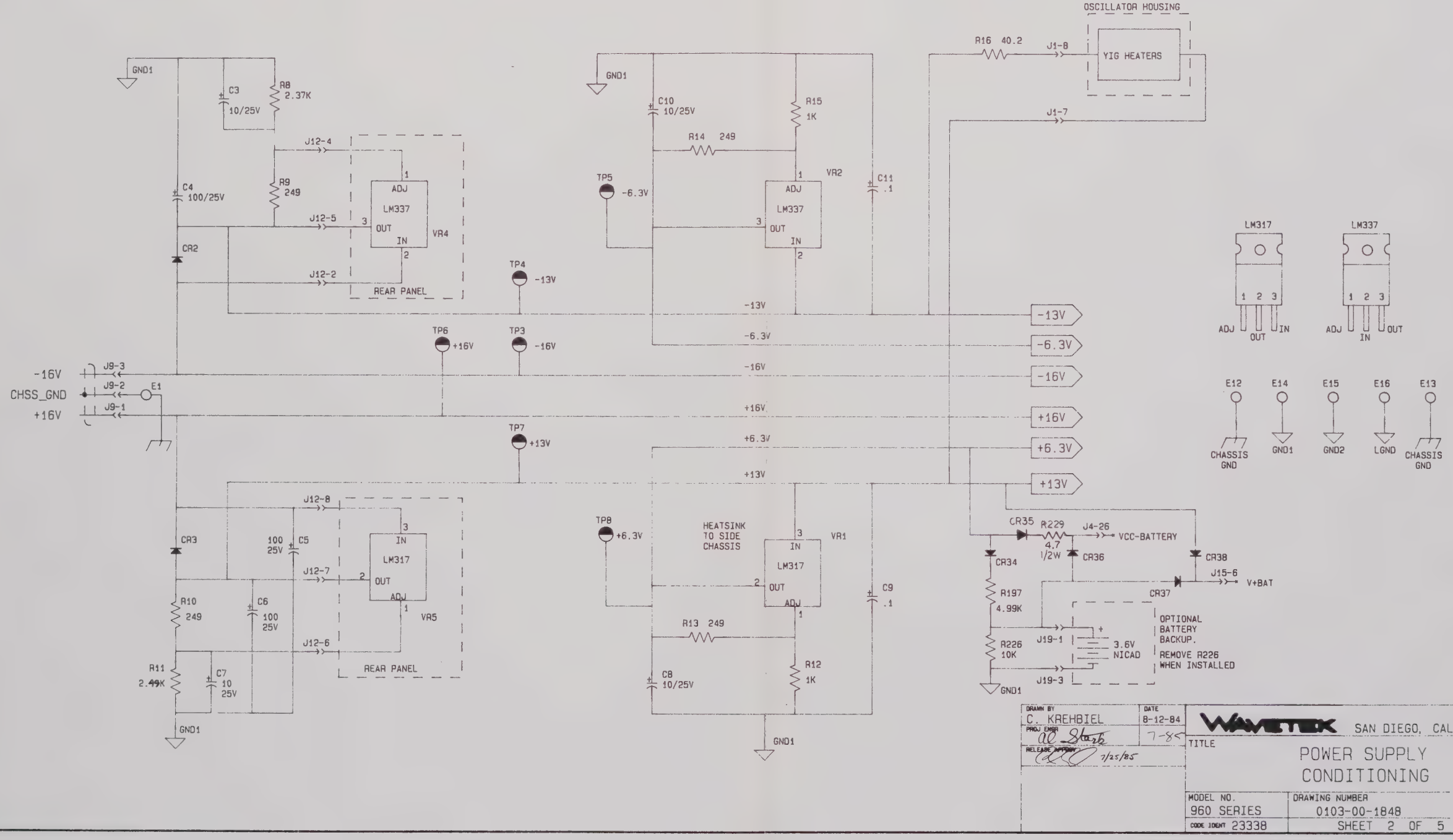
DRAWN BY: C. KREHBIEL	DATE: 8-12-84
PROJ ENGR: [signature]	7-85
RELEASE APPROV: [signature] 5/22/85	

WAVETEK SAN DIEGO, CALIFORNIA

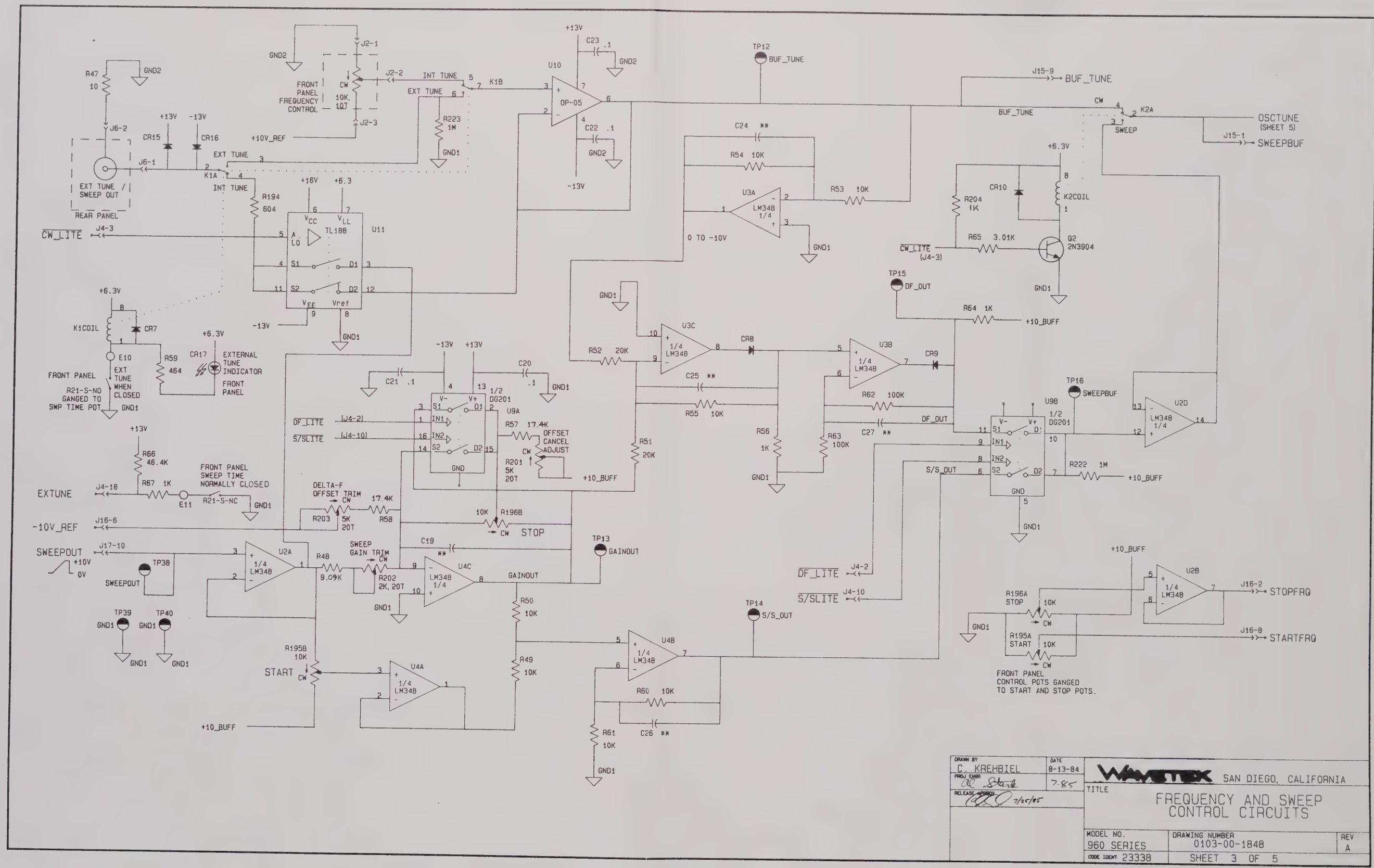
TITLE

+10 VOLT REFERENCE CIRCUIT

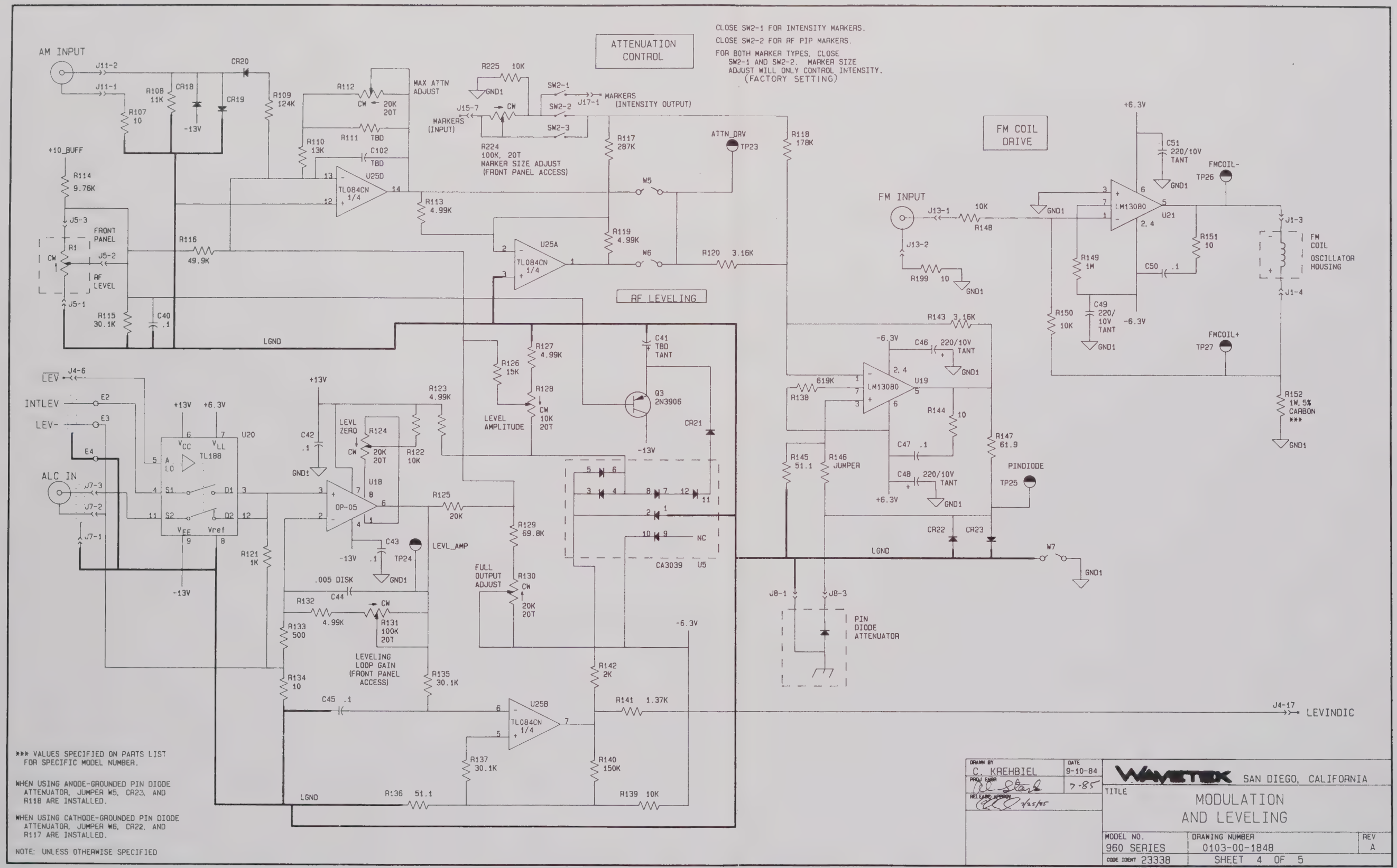
MODEL NO.	DRAWING NUMBER	REV
960 SERIES	0103-00-1848	A
CODE IDENT 23338	SHEET 1 OF 5	



DRAWN BY: C. KREHBIEL	DATE: 8-12-84	WAVETEK SAN DIEGO, CALIFORNIA
PROJ ENGR: [signature]	7-85	TITLE: POWER SUPPLY CONDITIONING
RELEASE APPROVAL: [signature]	7/25/85	
MODEL NO.: 960 SERIES	DRAWING NUMBER: 0103-00-1848	REV: A
CODE IDENT: 23338	SHEET 2 OF 5	



DRAWN BY: C. KREHBIEL	DATE: 8-13-84	WAVETEK SAN DIEGO, CALIFORNIA	
PROJ ENGR: [signature]	7-85	TITLE: FREQUENCY AND SWEEP CONTROL CIRCUITS	
RELEASE APPROV: [signature] 7/25/85		MODEL NO.: 960 SERIES	DRAWING NUMBER: 0103-00-1848
		CODE IDENT: 23338	SHEET 3 OF 5
			REV: A



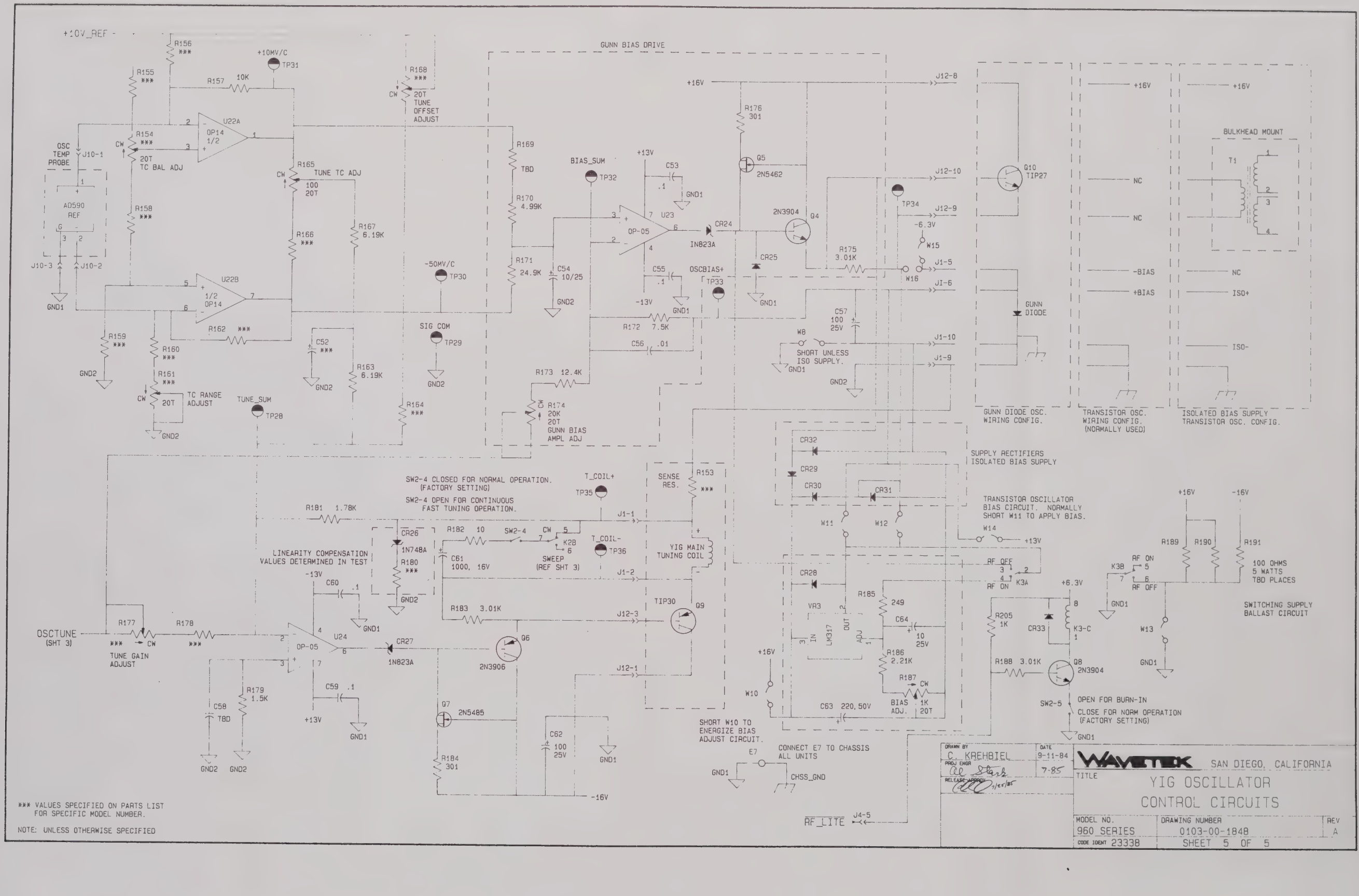
DRAWN BY	C. KREHBIEL
DATE	9-10-84
PROJ ENGR	7-85
RELEASE APPROV	7/25/85

WAVETEK SAN DIEGO, CALIFORNIA

TITLE

MODULATION AND LEVELING

MODEL NO.	DRAWING NUMBER	REV
960 SERIES	0103-00-1848	A
CODE IDENT 23338	SHEET 4 OF 5	



*** VALUES SPECIFIED ON PARTS LIST FOR SPECIFIC MODEL NUMBER.

NOTE: UNLESS OTHERWISE SPECIFIED

DRAWN BY C. KREHBIEL	DATE 9-11-84	WAVETEK SAN DIEGO, CALIFORNIA
PROJ ENGR Al Stark	7-85	TITLE YIG OSCILLATOR CONTROL CIRCUITS
RELEASE APPROV 11/20/85		MODEL NO. 960 SERIES
		DRAWING NUMBER 0103-00-1848 REV A
		CODE IDENT 23338 SHEET 5 OF 5

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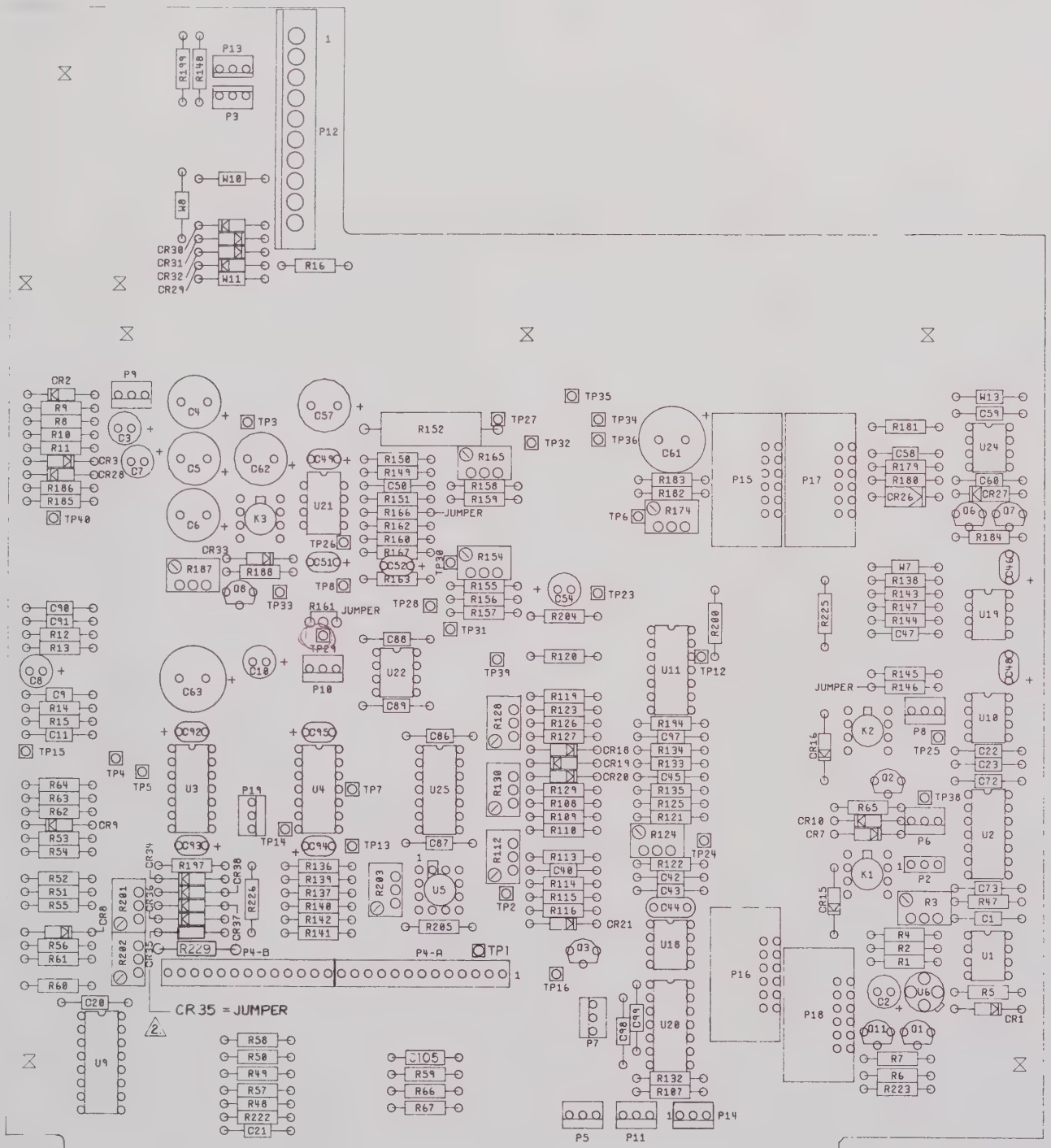
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	4917	AS	8-85	AS
C	7260	JM	9/22/86	DMD



⚠2 ALL JUMPERS TO BE TEFLON SLEEVED.

1. REFERENCE P/L 1208-00-1848.

NOTE UNLESS OTHERWISE SPECIFIED

CAD# A#55

0100-00-1848 REV: C
DD-1700-00-1848

WAVETEK MADE IN USA

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 5-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJ ENGR [signature]	7/85	TITLE .960 MAIN BD., PRE-WAVE
FINISH WAVETEK PROCESS —	MFG ENGR [signature]	7/25/85	
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG	MODEL NO 960 SERIES	DWG NO 0101-00-1848 REV C
	SCALE —	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS ACCUPRESS REORDER NO. A2788

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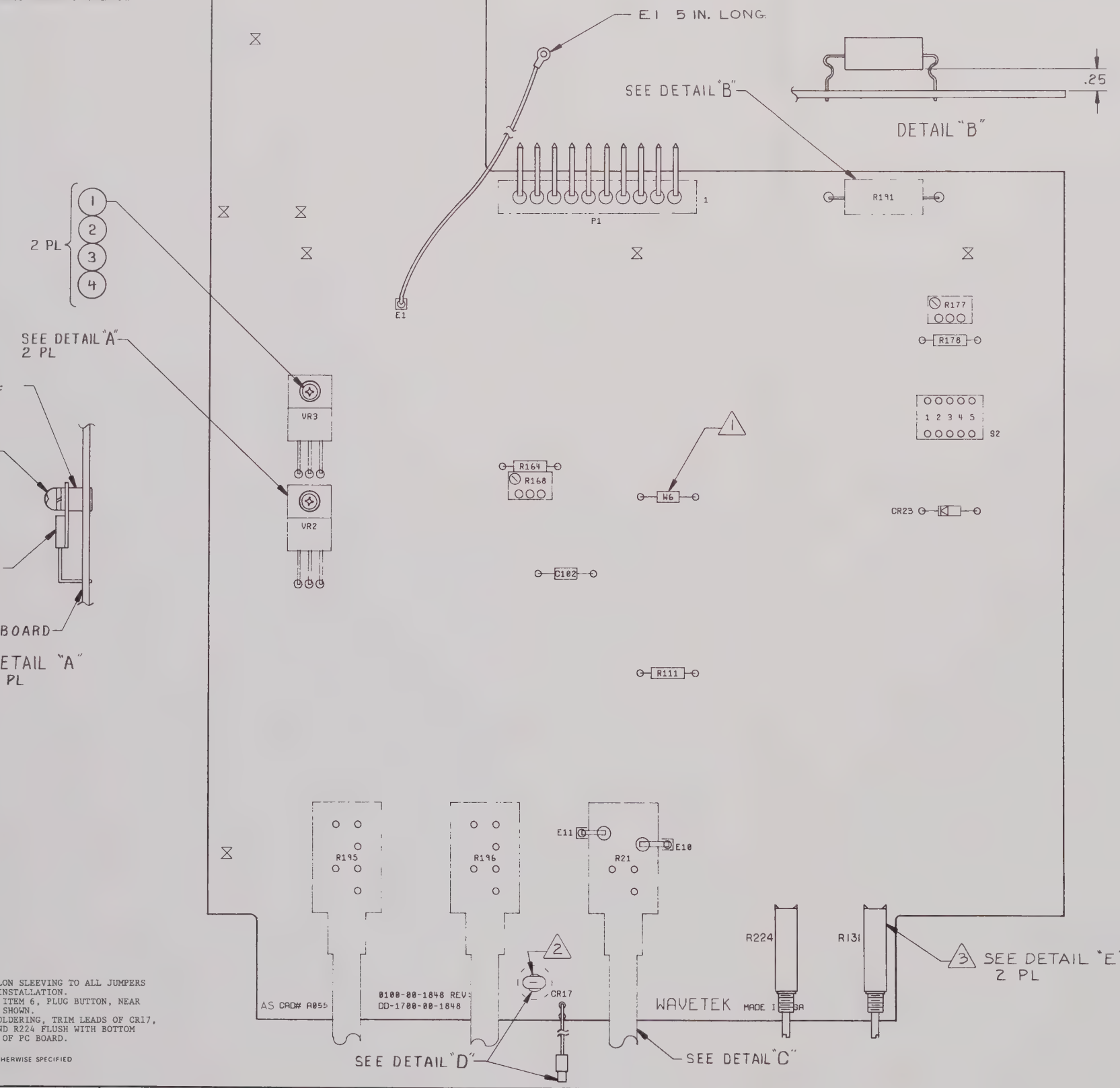
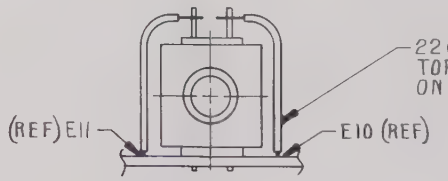
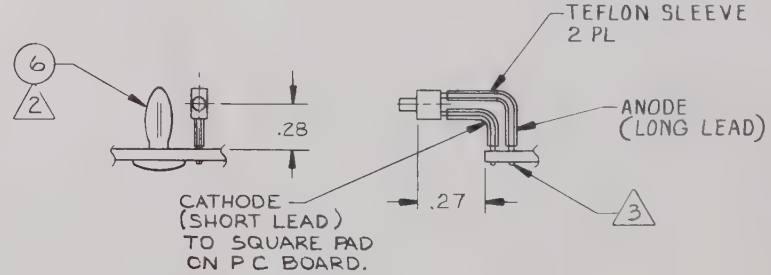
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	4970	AS	9-85	AS
C	7260	[illegible]	9/21/92	DMB



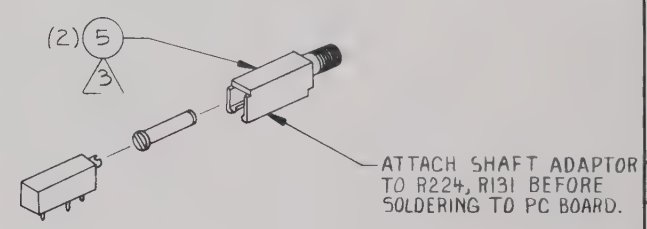
DETAIL "B"



DETAIL "C"



DETAIL "D"



DETAIL "E"
2 PL

1. ADD TEFLON SLEEVING TO ALL JUMPERS BEFORE INSTALLATION.
2. INSTALL ITEM 6, PLUG BUTTON, NEAR CR17 AS SHOWN.
3. AFTER SOLDERING, TRIM LEADS OF CR17, R131, AND R224 FLUSH WITH BOTTOM SURFACE OF PC BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

BISHOP GRAPHICS-ACCUPRESS REORDER NO A27086

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 5-85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENG		TITLE 962 MAIN BD., AFTER-WAVE
FINISH WAVETEK PROCESS	RELEASED PER ECN		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 962	DWG NO 0101-00-2222 REV C
	SCALE NONE	CODE IDENT 23338	SHEET 1 OF 1

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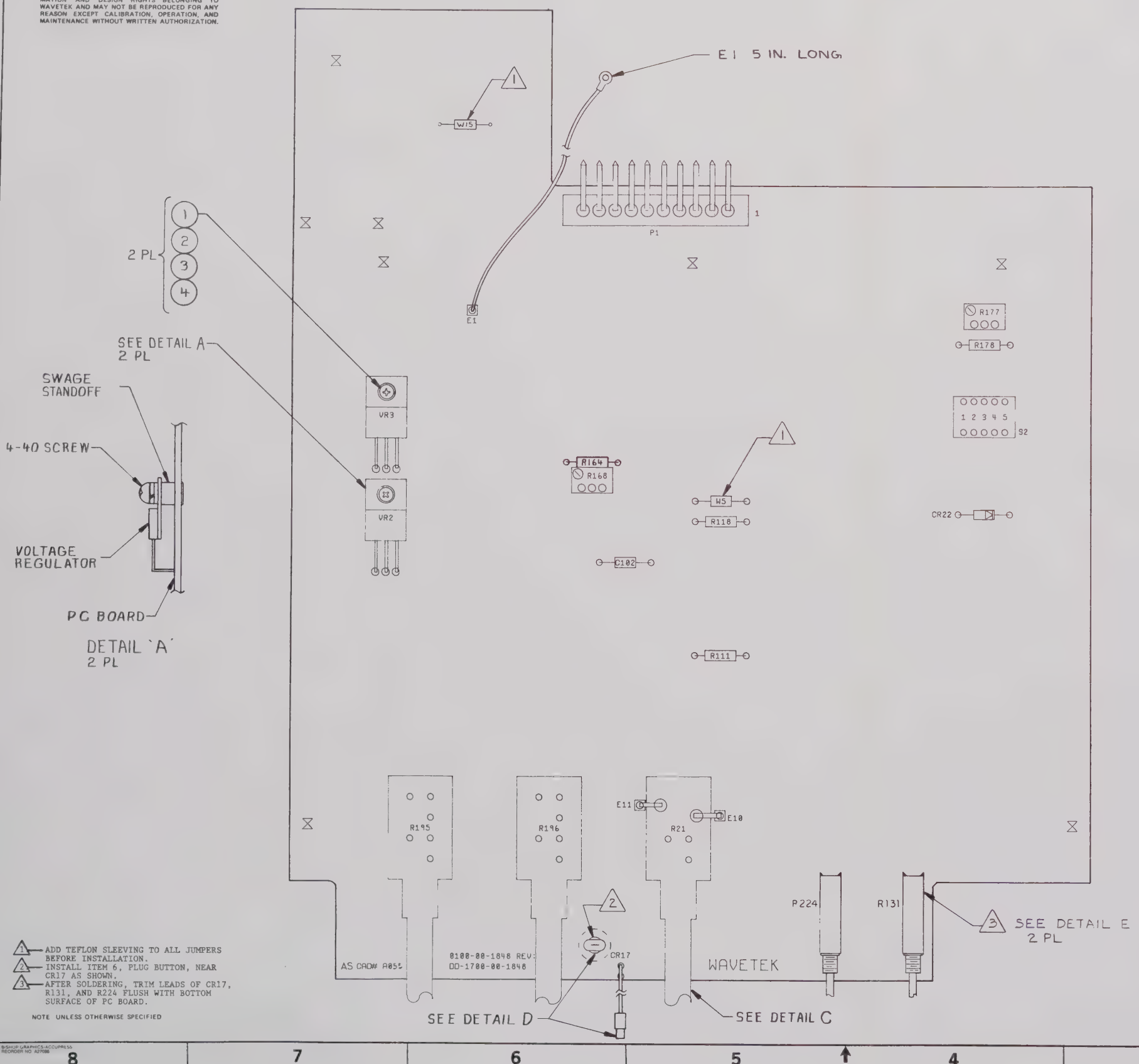
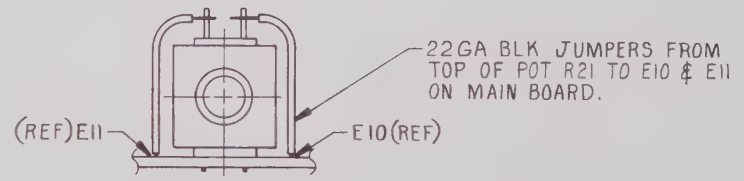
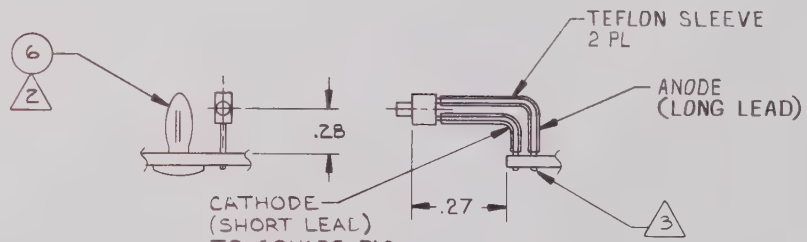
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	4970	AS	9-85	[illegible]
C	7260	[illegible]	9/23/86	DMB

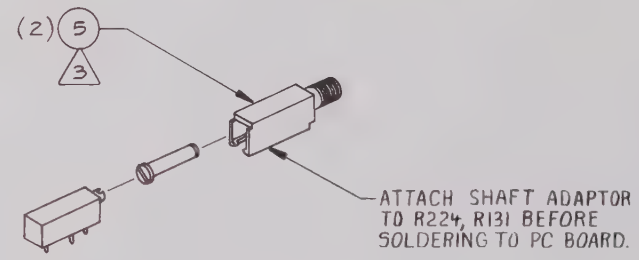




DETAIL 'C'



DETAIL 'D'



DETAIL 'E'
2 PL

1. ADD TEFLON SLEEVING TO ALL JUMPERS BEFORE INSTALLATION.
2. INSTALL ITEM 6, PLUG BUTTON, NEAR CR17 AS SHOWN.
3. AFTER SOLDERING, TRIM LEADS OF CR17, R131, AND R224 FLUSH WITH BOTTOM SURFACE OF PC BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 5-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR Al Stark	7/85	TITLE 964 MAIN BD., AFTER-WAVE
FINISH WAVETEK PROCESS	REVISED APPROV 7/25/85		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 964	DWG NO 0101-00-1890 REV C
	SCALE NONE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS ACCUPRESS REORDER NO A27086

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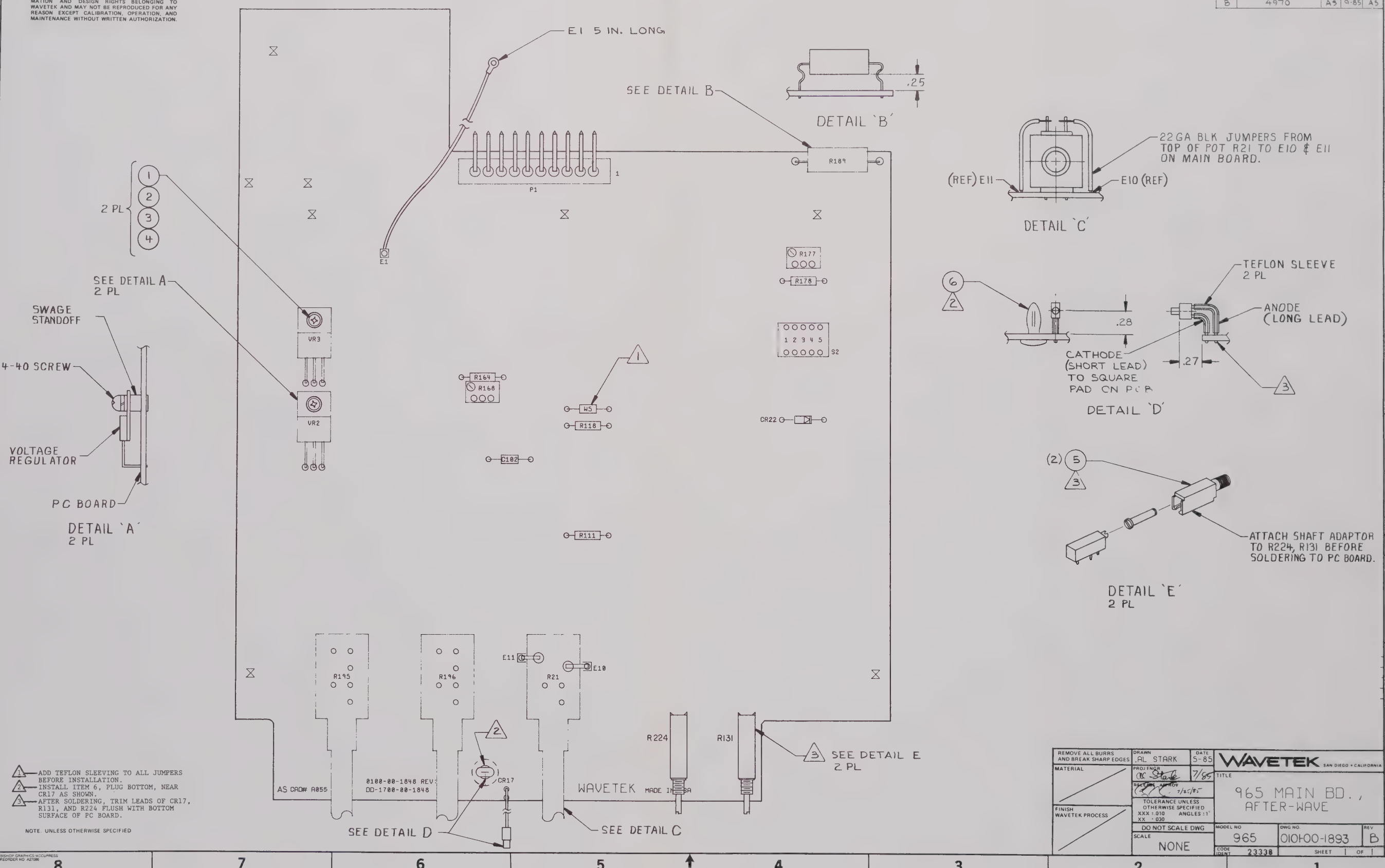
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	4970	AS	9-85	AS



1. ADD TEFLON SLEEVING TO ALL JUMPERS BEFORE INSTALLATION.
2. INSTALL ITEM 6, PLUG BOTTOM, NEAR CR17 AS SHOWN.
3. AFTER SOLDERING, TRIM LEADS OF CR17, R131, AND R224 FLUSH WITH BOTTOM SURFACE OF PC BOARD.

NOTE. UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 5-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR [signature]	7/85	TITLE 965 MAIN BD., AFTER-WAVE
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX .030		
	DO NOT SCALE DWG	MODEL NO 965	DWG NO. 010100-1893 REV B
	SCALE NONE	CODE IDENT 23338	SHEET OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO A2706

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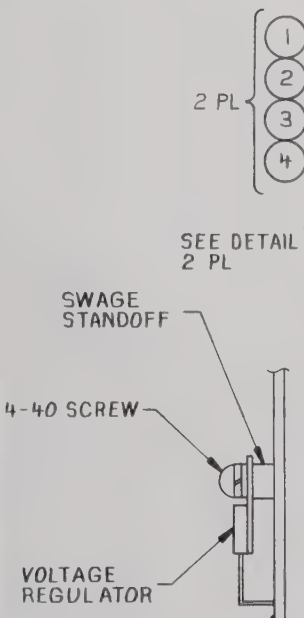
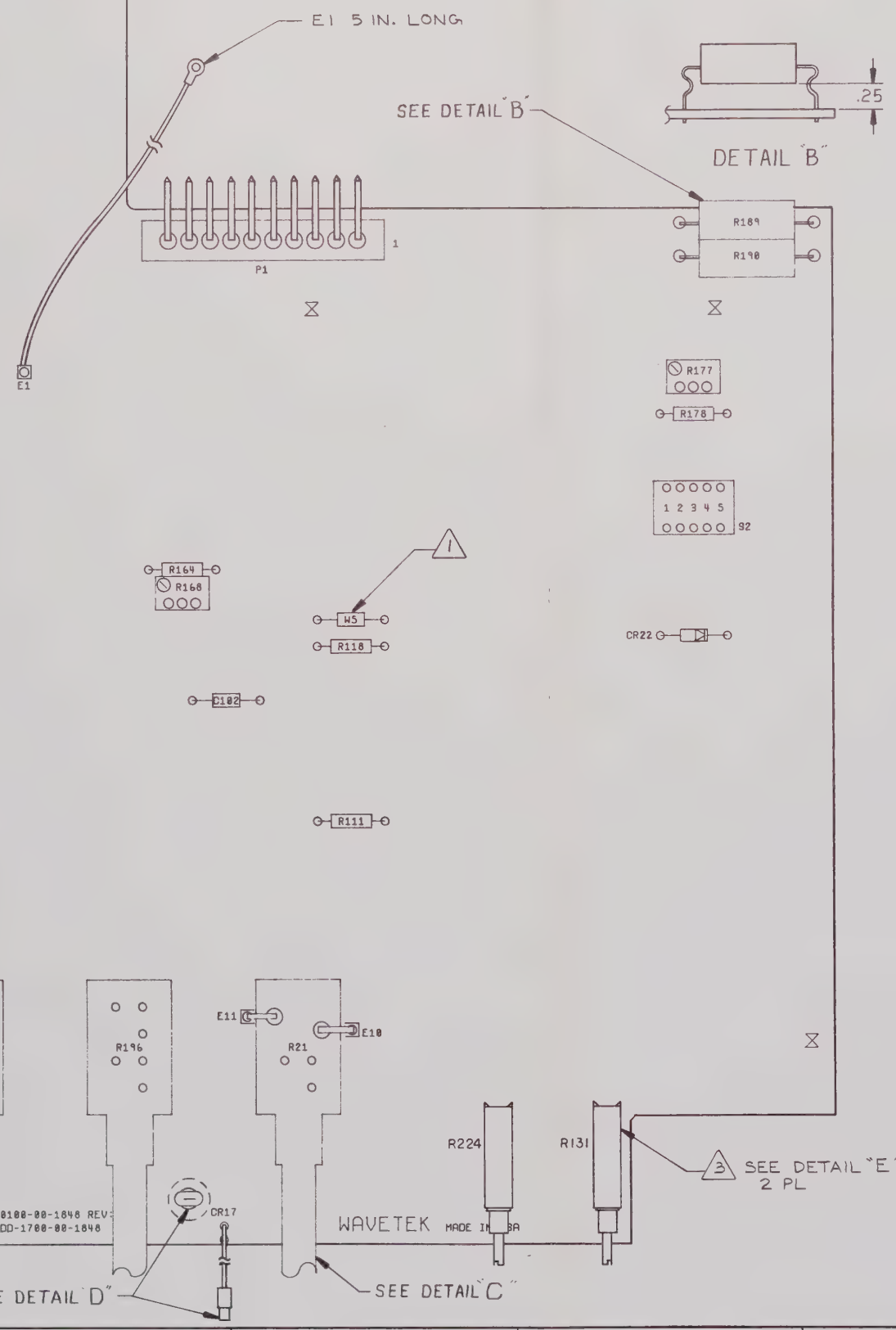
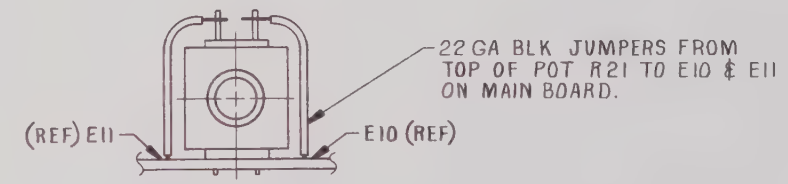
REV	ECN	BY	DATE	APP
A	RELEASED	AS	7-85	AS
B	4970	AS	9-85	AS



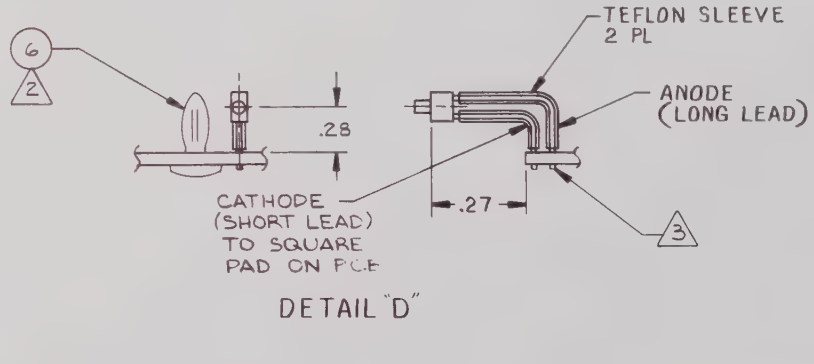
DETAIL "A"
2 PL



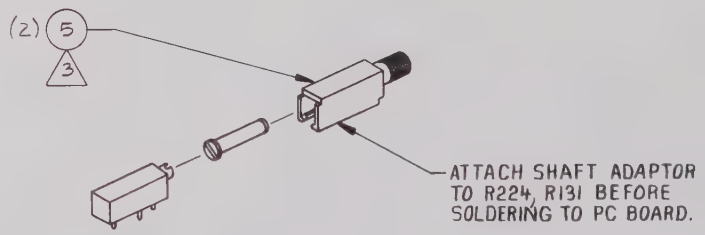
DETAIL "B"



DETAIL "C"



DETAIL "D"



DETAIL "E"
2 PL

1. ADD TEFLON SLEEVING TO ALL JUMPERS BEFORE INSTALLATION.
2. INSTALL ITEM 6, PLUG BOTTOM, NEAR CR17 AS SHOWN.
3. AFTER SOLDERING, TRIM LEADS OF CR17, R131, AND R224 FLUSH WITH BOTTOM SURFACE OF PC BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN AL STARK	DATE 5-85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR	7/8	TITLE: 967 MAIN BD., AFTER-WAVE
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO 967 / DWG NO 0101-00-1896 / REV B
	SCALE NONE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS, INC. / EXPRESS REORDER NO. A37086

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MAIN BOARD	0101-00-1848	WVTK	0101-00-1848	1
C1 C105 C11 C20 C21 C22 C23 C40 C42 C43 C45 C47 C50 C59 C60 C72 C73 C86 C87 C88 C89 C9 C90 C91 C97 C98 C99	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	27
C44	CAP, CER, .005MF, 50V	CK-502	CRL	1500-05-0210	1
C10 C2 C3 C54 C7 C8	CAP, ELECT, 10MF/25V RADIAL LEAD, SP .10	CRE SERIES 10/25	CAPAR	1500-31-0002	6
C4 C5 C57 C6 C62	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	5
C61	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
C63	CAP, ELECT, 220MF, 50V RADIAL LEAD	ULB1H221M	NICHC	1500-32-2103	1
C92 C93 C94 C95	CAP, TANT, 1MF, 35V	196D105X0035HA1	SPRAG	1500-71-0512	4
C46 C48 C49 C51	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	4
C52	CAP, TANT, 47MF, 20V	196D476X9020PE4	SPRAG	1500-74-7601	1
NONE	DRILL DRWG, MAIN BD	1700-00-1848	WVTK	1700-00-1848	1
P12	HEADER	1-640386-0	AMP	2100-02-0079	1
P10 P11 P13 P19 P3 P5 P6 P7 P8 P9	CONN HEADER 3 PIN	640456-3	AMP	2100-02-0116	10

WAVETEK PARTS LIST | TITLE: PRE WAVE LOAD MAIN BD | ASSEMBLY NO. 1208-00-1848 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
P15 P16 P17 P18	CONN, W/SHROUD, 12 PIN	AMP	102567-	2100-02-0166	4
P4A P4B	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	2
P14 P2	3 POS HEADER	22-10-2031	MOLEX	2100-03-0052	2
TP1 TP12 TP13 TP14 TP15 TP16 TP2 TP23 TP24 TP25 TP26 TP27 TP28 TP29 TP3 TP30 TP31 TP32 TP33 TP34 TP35 TP36 TP38 TP39 TP4 TP40 TP5 TP6 TP7 TP8	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	30
CR35 R146 R161 R166 W10 W11 W13 W7 W8	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	9
K1 K2 K3	RELAY	CSW-5	HI-G	4500-00-0016	3
R128	POT, TRIM, 20T, 10K	68WR10K	BECK	4609-90-0002	1
R112 R124 R130	POT, TRIM, 20T, 20K	68WR20K	BECK	4609-90-0003	3
R202	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
R154 R187 R3	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	3
R201 R203	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	2
R165	POT, TRIM, 20T, 100	68WR100	BECK	4609-90-0019	1
R229	RES, C, 1/2W, 5%, 4.7	RC-1/2-4R7J	STKPL	4700-25-0479	1

WAVETEK PARTS LIST | TITLE: PRE WAVE LOAD MAIN BD | ASSEMBLY NO. 1208-00-1848 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R152	RES, C, 1W, 5%, 43	RC32GF430J	AB	4700-35-0430	1
R12 R121 R15 R160 R204 R205 R56 R64 R67	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	9
R122 R139 R148 R150 R157 R162 R225 R226 R49 R50 R54 R55 R60 R61	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	14
R62 R63	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	2
R149 R222 R223	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	3
R107 R134 R144 R151 R182 R199 R47	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	7
R108 R158	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	2
R155	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
R141	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
R109	RES, MF, 1/8W, 1%, 124K	RN55D-1243F	TRW	4701-03-1243	1
R110	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
R179	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
R126	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
R140	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1

WAVETEK PARTS LIST | TITLE: PRE WAVE LOAD MAIN BD | ASSEMBLY NO. 1208-00-1848 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R57	RES, MF, 1/8W, 1%, 17.4K	RN55D-1742F	TRW	4701-03-1742	1
R181	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
R58	RES, MF, 1/8W, 1%, 19.6K	RN55D-1962F	TRW	4701-03-1962	1
R142	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1
R125 R51 R52	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	3
R186	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
R8	RES, MF, 1/8W, 1%, 2.37K	RN55D-2371F	TRW	4701-03-2371	1
R10 R13 R14 R185 R9	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	5
R11	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
R2	RES, MF, 1/8W, 1%, 2.87K	RN55D-2871F	TRW	4701-03-2871	1
R184	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
R1 R183 R188 R65	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	4
R115 R135 R137	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	3
R120 R143	RES, MF, 1/8W, 1%, 3.16K	RN55D-3161F	TRW	4701-03-3161	2
R16	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	1
R59	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
R66	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1

WAVETEK PARTS LIST | TITLE: PRE WAVE LOAD MAIN BD | ASSEMBLY NO. 1208-00-1848 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PRE-WAVE MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 960 / DWG NO 1208-00-1848 / REV A
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 2
	SCALE		

BISHOP GRAPHICS, ACCUPRESS RECORDER NO. A2-580

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R133 R5 R7	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	3
R113 R119 R123 R127 R132 R197 R200 R53	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	8
R116	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R136 R145	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	2
R194	RES, MF, 1/8W, 1%, 604	RN55D-6040F	TRW	4701-03-6040	1
R156 R163 R167 R4	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	4
R147	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
R159	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
R129	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
R48	RES, MF, 1/8W, 1%, 9.09K	RN55D-9091F	TRW	4701-03-9091	1
R114	RES, MF, 1/8W, 1%, 9.76K	RN55D-9761F	TRW	4701-03-9761	1
R138	RES, MF, 1/4W, 1%, 619K	RN60D-6193F	TRW	4701-13-6193	1
R6	RES, MF, 1/4W, 1%, 698K	RN60D-6983F	TRW	4701-13-6983	1
CR26	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
CR27	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
CR1 CR10 CR15 CR16 CR18	DIODE	1N4148	FAIR	4807-02-6666	23

WAVETEK PARTS LIST	TITLE: PRE WAVE LOAD MAIN BD	ASSEMBLY NO. 1208-00-1848	REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR19 CR2 CR20 CR21 CR28 CR29 CR3 CR30 CR31 CR32 CR33 CR34 CR36 CR37 CR38 CR7 CR8 CR9					
Q1 Q11 Q2 Q8	TRANS	2N3904	FAIR	4901-03-9040	4
Q3 Q6	TRANS	2N3906	FAIR	4901-03-9060	2
Q7	TRANS	2N5485	MOT	4901-05-4850	1
U1 U10 U18 U24	IC	OP-05CP	PMI	7000-00-0500	4
U22	IC	OP-14CP	PMI	7000-00-1400	1
U25	IC	TL084CN	TI	7000-00-8400	1
U11 U20	IC	TL188CN	TI	7000-01-8800	2
U2 U3 U4	IC	LM348N	NSC	7000-03-4800	3
U6	IC	LM399H	NSC	7000-03-9910	1
U19 U21	IC, PWR OP-AMP	LM13080	NSC	7000-13-0800	2
U5	IC	CA-3039	RCA	7000-30-3900	1
U9	IC	DG201CJ	SILX	8000-02-0101	1

WAVETEK PARTS LIST	TITLE: PRE WAVE LOAD MAIN BD	ASSEMBLY NO. 1208-00-1848	REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PRE-WAVE MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 960 / DWG NO 1208-00-1848 / REV A
	SCALE		CODE IDENT 23338 / SHEET 2 OF 2

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MAIN BOARD 962	0101-00-2222	WVTK	0101-00-2222	1
NONE	SCHEMATIC, MAIN BD	WVTK	0103-00	0103-00-1848	1
NONE	ASSY DRWG, MAIN BOARD	0101-00-1848	WVTK	0101-00-1848	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, .005MF, 50V	CK-502	CRL	1500-05-0210	1
NONE	CAP, ELECT, 10MF/25V RADIAL LEAD, SP .10	CRE SERIES 10/25	CAPAR	1500-31-0002	1
NONE	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
NONE	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
NONE	CAP, ELECT, 220MF, 50V RADIAL LEAD	ULB1H221M	NICHC	1500-32-2103	1
NONE	CAP, TANT, 1MF, 35V	196D105X0035HA1	SPRAG	1500-71-0512	1
NONE	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	CAP, TANT, 47MF, 20V	196D476X9020PE4	SPRAG	1500-74-7601	1
NONE	DRILL DRWG, MAIN BD	1700-00-1848	WVTK	1700-00-1848	1
NONE	HEADER	1-640386-0	AMP	2100-02-0079	1

WAVETEK PARTS LIST | TITLE: ASSY, MAIN BOARD, 962 | ASSEMBLY NO. 1100-00-2222 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
NONE	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
NONE	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
NONE	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
NONE	RES, MF, 1/8W, 1%, 124K	RN55D-1243F	TRW	4701-03-1243	1
NONE	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
NONE	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
NONE	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
NONE	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
NONE	RES, MF, 1/8W, 1%, 17.4K	RN55D-1742F	TRW	4701-03-1742	1
NONE	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
NONE	RES, MF, 1/8W, 1%, 19.6K	RN55D-1962F	TRW	4701-03-1962	1
NONE	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1

WAVETEK PARTS LIST | TITLE: ASSY, MAIN BOARD, 962 | ASSEMBLY NO. 1100-00-2222 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	CONN HEADER 3 PIN	640456-3	AMP	2100-02-0116	1
NONE	CONN, W/SHROUD, 12 PIN	AMP 102567-		2100-02-0166	1
NONE	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	1
NONE	3 POS HEADER	22-10-2031	MOLEX	2100-03-0052	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
NONE	RELAY	CSW-5	HI-Q	4500-00-0016	1
NONE	POT, TRIM, 20T, 10K	68WR10K	BECK	4609-90-0002	1
NONE	POT, TRIM, 20T, 20K	68WR20K	BECK	4609-90-0003	1
NONE	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
NONE	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
NONE	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	1
NONE	POT, TRIM, 20T, 100	68WR100	BECK	4609-90-0019	1
NONE	RES, C, 1/2W, 5%, 4.7	RC-1/2-4R7J	STKPL	4700-25-0479	1
NONE	RES, C, 1W, 5%, 43	RC32GF430J	AB	4700-35-0430	1
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1

WAVETEK PARTS LIST | TITLE: ASSY, MAIN BOARD, 962 | ASSEMBLY NO. 1100-00-2222 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
NONE	RES, MF, 1/8W, 1%, 2.37K	RN55D-2371F	TRW	4701-03-2371	1
NONE	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
NONE	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
NONE	RES, MF, 1/8W, 1%, 2.87K	RN55D-2871F	TRW	4701-03-2871	1
NONE	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
NONE	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 3.16K	RN55D-3161F	TRW	4701-03-3161	1
NONE	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	1
NONE	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
NONE	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1
NONE	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
NONE	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
NONE	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
NONE	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1

WAVETEK PARTS LIST | TITLE: ASSY, MAIN BOARD, 962 | ASSEMBLY NO. 1100-00-2222 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

L BURRS SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 962 · DWG NO 1100-00-2222 · REV A
	SCALE		CODE IDENT 23338 · SHEET 1 OF 2

B SHOP GRAPHICS/ACCUPRESS REORDER NO. A27000

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 604	RN55D-6040F	TRW	4701-03-6040	1
NONE	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
NONE	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
NONE	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
NONE	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
NONE	RES, MF, 1/8W, 1%, 9.09K	RN55D-9091F	TRW	4701-03-9091	1
NONE	RES, MF, 1/8W, 1%, 9.76K	RN55D-9761F	TRW	4701-03-9761	1
NONE	RES, MF, 1/4W, 1%, 619K	RN60D-6193F	TRW	4701-13-6193	1
NONE	RES, MF, 1/4W, 1%, 698K	RN60D-6983F	TRW	4701-13-6983	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	TRANS	2N3904	FAIR	4901-03-9040	1
NONE	TRANS	2N3906	FAIR	4901-03-9060	1
NONE	TRANS	2N5485	MOT	4901-05-4850	1
NONE	IC	OP-05CP	PMI	7000-00-0500	1
NONE	IC	OP-14CP	PMI	7000-00-1400	1

WAVETEK PARTS LIST	TITLE: ASSY, MAIN BOARD, 962	ASSEMBLY NO. 1100-00-2222	REV A

PAGE 5

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
4	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	2
R21	POT, SWITCH, 1T, 50K	WYLE-26-M-075	AB	4600-05-0302	1
R131 R224	POT, 20T, 100K	43P104	SPECT	4600-11-0402	2
R195 R196	POT, DUAL, 10K, 5%, CERMET, CONCENTRIC SHAFTS	26M742	WYLE	4600-21-0305	2
R177	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
R168	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	1
R164	RES, MF, 1/8W, 1%, 16.5K	RN55D-1652F	TRW	4701-03-1652	1
R117	RES, MF, 1/8W, 1%, 287K	RN55D-2873F	TRW	4701-03-2873	1
R178	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R191	RES, WW, 5W, 10%, 100	RS-5-100-10	DALE	4702-66-1000	1
CR23	DIODE	1N4148	FAIR	4807-02-6666	1
CR17	LED, RED	LN230RP	PANAS	4899-00-0042	1
S2	SWITCH PC	500-105	DUNCN	5199-00-0001	1
VR3	IC	LM317T	NSC	7000-03-1700	1
VR2	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1

WAVETEK PARTS LIST	TITLE: ASSY, MAIN BOARD, 962	ASSEMBLY NO. 1100-00-2222	REV A

PAGE 7

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC	TL084CN	TI	7000-00-8400	1
NONE	IC	TL188CN	TI	7000-01-8800	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC	LM399H	NSC	7000-03-9910	1
NONE	IC, PWR OP-AMP	LM13080	NSC	7000-13-0800	1
NONE	IC	CA-3039	RCA	7000-30-3900	1
NONE	IC	DG201CJ	SILX	8000-02-0101	1
P1	CONN, HEADER	1-640387-0	AMP	2100-02-0104	1
1	STANDOFF, SWAGE .125 H, .250 DIA4-40, .062 MAT'L	9531B-0440-3A	AMTOM	2800-03-0004	2
6	PLUG BUTTON	PC47291	UNCAR	2800-09-0010	1
W6	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
2	WASHER, FLAT, #4(.312 O.D.)	#4FW	CMRCL	2800-26-4000	2
5	SHAFT ADAPTER, POT	6-1-2	SPECT	2800-32-0003	2
3	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	2

WAVETEK PARTS LIST	TITLE: ASSY, MAIN BOARD, 962	ASSEMBLY NO. 1100-00-2222	REV A

PAGE 6

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 962 / DWG NO 1100-00-2222 / REV A
	SCALE		CODE IDENT 23338 / SHEET 2 OF 2

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG MAIN BOARD 964	0101-00-1890	WVTK	0101-00-1890	1
NONE	SCHEMATIC, MAIN BD	WVTK	0103-00	0103-00-1848	1
NONE	ASSY DRWG, MAIN BOARD	0101-00-1848	WVTK	0101-00-1848	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, .005MF, 50V	CK-502	CRL	1500-05-0210	1
NONE	CAP, ELECT, 10MF/25V RADIAL LEAD, SP .10	CRE SERIES 10/25	CAPAR	1500-31-0002	1
NONE	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
NONE	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
NONE	CAP, ELECT, 220MF, 50V RADIAL LEAD	ULB1H221M	NICHC	1500-32-2103	1
NONE	CAP, TANT, 1MF, 35V	196D105X0035HA1	SPRAG	1500-71-0512	1
NONE	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	CAP, TANT, 47MF, 20V	196D476X9020PE4	SPRAG	1500-74-7601	1
NONE	DRILL DRWG, MAIN BD	1700-00-1848	WVTK	1700-00-1848	1
NONE	HEADER	1-640386-0	AMP	2100-02-0079	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 964 | ASSEMBLY NO. 1100-00-1890 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	CONN HEADER 3 PIN	640456-3	AMP	2100-02-0116	1
NONE	CONN, W/SHROUD, 12 PIN	AMP	102567-	2100-02-0166	1
NONE	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	1
NONE	3 POS HEADER	22-10-2031	MOLEX	2100-03-0052	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
NONE	RELAY	CSW-5	HI-G	4500-00-0016	1
NONE	POT, TRIM, 20T, 10K	68WR10K	BECK	4609-90-0002	1
NONE	POT, TRIM, 20T, 20K	68WR20K	BECK	4609-90-0003	1
NONE	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
NONE	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
NONE	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	1
NONE	POT, TRIM, 20T, 100	68WR100	BECK	4609-90-0019	1
NONE	RES, C, 1/2W, 5%, 4.7	RC-1/2-4R7J	STKPL	4700-25-0479	1
NONE	RES, C, 1W, 5%, 43	RC32GF430J	AB	4700-35-0430	1
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 964 | ASSEMBLY NO. 1100-00-1890 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
NONE	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
NONE	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
NONE	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
NONE	RES, MF, 1/8W, 1%, 124K	RN55D-1243F	TRW	4701-03-1243	1
NONE	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
NONE	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
NONE	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
NONE	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
NONE	RES, MF, 1/8W, 1%, 17.4K	RN55D-1742F	TRW	4701-03-1742	1
NONE	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
NONE	RES, MF, 1/8W, 1%, 19.6K	RN55D-1962F	TRW	4701-03-1962	1
NONE	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 964 | ASSEMBLY NO. 1100-00-1890 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
NONE	RES, MF, 1/8W, 1%, 2.37K	RN55D-2371F	TRW	4701-03-2371	1
NONE	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
NONE	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
NONE	RES, MF, 1/8W, 1%, 2.87K	RN55D-2871F	TRW	4701-03-2871	1
NONE	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
NONE	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 3.16K	RN55D-3161F	TRW	4701-03-3161	1
NONE	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	1
NONE	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
NONE	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1
NONE	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
NONE	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
NONE	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
NONE	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 964 | ASSEMBLY NO. 1100-00-1890 | REV A

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 1100-00-1890 / REV A
	SCALE		CODE IDENT 23338 / SHEET 1 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A27086

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 604	RN55D-6040F	TRW	4701-03-6040	1
NONE	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
NONE	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
NONE	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
NONE	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
NONE	RES, MF, 1/8W, 1%, 9.09K	RN55D-9091F	TRW	4701-03-9091	1
NONE	RES, MF, 1/8W, 1%, 9.76K	RN55D-9761F	TRW	4701-03-9761	1
NONE	RES, MF, 1/4W, 1%, 619K	RN60D-6193F	TRW	4701-13-6193	1
NONE	RES, MF, 1/4W, 1%, 698K	RN60D-6983F	TRW	4701-13-6983	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	TRANS	2N3904	FAIR	4901-03-9040	1
NONE	TRANS	2N3906	FAIR	4901-03-9060	1
NONE	TRANS	2N5485	MOT	4901-05-4850	1
NONE	IC	OP-05CP	PMI	7000-00-0500	1
NONE	IC	OP-14CP	PMI	7000-00-1400	1

WAVETEK PARTS LIST	TITLE: PCA, MAINBOARD MODEL 964	ASSEMBLY NO. 1100-00-1890	REV A

PAGE 5

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
4	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	2
R21	POT, SWITCH, 1T, 50K	WYLE-26-M-075	AB	4600-05-0302	1
R131 R224	POT, 20T, 100K	43P104	SPECT	4600-11-0402	2
R195 R196	POT, DUAL, 10K, 5%, CERMET, CONCENTRIC SHAFTS	26M742	WYLE	4600-21-0305	2
R168	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
R177	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
R118	RES, MF, 1/8W, 1%, 178K	RN55D-1783F	TRW	4701-03-1783	1
R178	RES, MF, 1/8W, 1%, 6.81K	RN55D-6811F	TRW	4701-03-6811	1
R164	RES, MF, 1/8W, 1%, 9.53K	RN55D-9531F	TRW	4701-03-9531	1
CR22	DIODE	1N4148	FAIR	4807-02-6666	1
CR17	LED, RED	LN230RP	PANAS	4899-00-0042	1
S2	SWITCH PC	500-105	DUNCN	5199-00-0001	1
VR3	IC	LM317T	NSC	7000-03-1700	1
VR2	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1

WAVETEK PARTS LIST	TITLE: PCA, MAINBOARD MODEL 964	ASSEMBLY NO. 1100-00-1890	REV A

PAGE 7

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC	TL084CN	TI	7000-00-8400	1
NONE	IC	TL188CN	TI	7000-01-8800	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC	LM399H	NSC	7000-03-9910	1
NONE	IC, PWR OP-AMP	LM13080	NSC	7000-13-0800	1
NONE	IC	CA-3039	RCA	7000-30-3900	1
NONE	IC	DG201CJ	SILX	8000-02-0101	1
P1	CONN, HEADER	1-640387-0	AMP	2100-02-0104	1
1	STANDOFF, SWAGE .125 H, .250 DIA4-40, .062 MAT'L	9531B-0440-3A	AMTOM	2800-03-0004	2
6	PLUG BUTTON	PC47291	UNCAR	2800-09-0010	1
W15 W5	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	2
2	WASHER, FLAT, 4(.312 O.D.)	#4FW	CMRCL	2800-26-4000	2
5	SHAFT ADAPTER, POT	6-1-2	SPECT	2800-32-0003	2
3	SCREW, PAN, CAD I, CROSS RECESS,	MS51957-13	COML	2800-38-4104	2

WAVETEK PARTS LIST	TITLE: PCA, MAINBOARD MODEL 964	ASSEMBLY NO. 1100-00-1890	REV A

PAGE 6

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 1100-00-1890 / REV A
	SCALE		CODE IDENT 23338 / SHEET 2 OF 2

BISHOP GRAPHICS INC. NORTH REORDER NO. A27098

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REV		BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
NONE	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
NONE	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
NONE	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
NONE	RES, MF, 1/8W, 1%, 124K	RN55D-1243F	TRW	4701-03-1243	1
NONE	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
NONE	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
NONE	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
NONE	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
NONE	RES, MF, 1/8W, 1%, 17.4K	RN55D-1742F	TRW	4701-03-1742	1
NONE	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
NONE	RES, MF, 1/8W, 1%, 19.6K	RN55D-1962F	TRW	4701-03-1962	1
NONE	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MAIN BOARD 965	0101-00-1893	WVTK	0101-00-1893	1
NONE	SCHEMATIC, MAIN BD	WVTK	0103-00	0103-00-1848	1
E1					1
NONE	ASSY DRWG, MAIN BOARD	0101-00-1848	WVTK	0101-00-1848	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, .005MF, 50V	CK-502	CRL	1500-05-0210	1
NONE	CAP, ELECT, 10MF/25V RADIAL LEAD, SP .10	CRE SERIES 10/25	CAPAR	1500-31-0002	1
NONE	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
NONE	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
NONE	CAP, ELECT, 220MF, 50V RADIAL LEAD	ULB1H221M	NICHC	1500-32-2103	1
NONE	CAP, TANT, 1MF, 35V	196D105X0035HA1	SPRAG	1500-71-0512	1
NONE	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	CAP, TANT, 47MF, 20V	196D476X9020PE4	SPRAG	1500-74-7601	1
NONE	DRILL DRWG, MAIN BD	1700-00-1848	WVTK	1700-00-1848	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1
NONE	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
NONE	RES, MF, 1/8W, 1%, 2.37K	RN55D-2371F	TRW	4701-03-2371	1
NONE	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
NONE	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
NONE	RES, MF, 1/8W, 1%, 2.87K	RN55D-2871F	TRW	4701-03-2871	1
NONE	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
NONE	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 3.16K	RN55D-3161F	TRW	4701-03-3161	1
NONE	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	1
NONE	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
NONE	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1
NONE	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
NONE	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
NONE	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	HEADER	1-640386-0	AMP	2100-02-0079	1
NONE	CONN HEADER 3 PIN	640456-3	AMP	2100-02-0116	1
NONE	CONN, W/SHROUD, 12 PIN	AMP	102567-	2100-02-0166	1
NONE	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	1
NONE	3 POS HEADER	22-10-2031	MOLEX	2100-03-0052	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
NONE	RELAY	CSW-5	HI-Q	4500-00-0016	1
NONE	POT, TRIM, 20T, 10K	68WR10K	BECK	4609-90-0002	1
NONE	POT, TRIM, 20T, 20K	68WR20K	BECK	4609-90-0003	1
NONE	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
NONE	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
NONE	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	1
NONE	POT, TRIM, 20T, 100	68WR100	BECK	4609-90-0019	1
NONE	RES, C, 1/2W, 5%, 4.7	RC-1/2-4R7J	STKPL	4700-25-0479	1
NONE	RES, C, 1W, 5%, 43	RC32GF430J	AB	4700-35-0430	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 965 / DWG NO 1100-00-1893 / REV A
	SCALE		CODE IDENT 23338 / SHEET 1 OF 2

BISHOP GRAPHICS-ACCUPRESS REORDER NO A27000

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1
NONE	RES, MF, 1/8W, 1%, 604	RN55D-6040F	TRW	4701-03-6040	1
NONE	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
NONE	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
NONE	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
NONE	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
NONE	RES, MF, 1/8W, 1%, 9.09K	RN55D-9091F	TRW	4701-03-9091	1
NONE	RES, MF, 1/8W, 1%, 9.76K	RN55D-9761F	TRW	4701-03-9761	1
NONE	RES, MF, 1/4W, 1%, 619K	RN60D-6193F	TRW	4701-13-6193	1
NONE	RES, MF, 1/4W, 1%, 698K	RN60D-6983F	TRW	4701-13-6983	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	TRANS	2N3904	FAIR	4901-03-9040	1
NONE	TRANS	2N3906	FAIR	4901-03-9060	1
NONE	TRANS	2N5485	MOT	4901-05-4850	1
NONE	IC	OP-05CP	PMI	7000-00-0500	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC	OP-14CP	PMI	7000-00-1400	1
NONE	IC	TL084CN	TI	7000-00-8400	1
NONE	IC	TL188CN	TI	7000-01-8800	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC	LM399H	NSC	7000-03-9910	1
NONE	IC, PWR OP-AMP	LM13080	NSC	7000-13-0800	1
NONE	IC	CA-3039	RCA	7000-30-3900	1
NONE	IC	DG201CJ	SILX	8000-02-0101	1
P1	CONN, HEADER	1-640387-0	AMP	2100-02-0104	1
1	STANDOFF, SWAGE .125 H, .250 DIA4-40, .062 MAT'L	9531B-0440-3A	AMTOM	2800-03-0004	2
6	PLUG BUTTON	PC47291	UNCAR	2800-09-0010	1
W5	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
3	WASHER, FLAT, 4(.312 O.D.)	#4FW	CMRCL	2800-26-4000	2
5	SHAFT ADAPTER, POT	6-1-2	SPECT	2800-32-0003	2
2	SCREW, PAN, CAD I,	MS51957-13	COML	2800-38-4104	2

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	CROSS RECESS,				
4	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	2
R21	POT, SWITCH, 1T, 50K	WYLE-26-M-075	AB	4600-05-0302	1
R131 R224	POT, 20T, 100K	43P104	SPECT	4600-11-0402	2
R195 R196	POT, DUAL, 10K, 5%, CERMET, CONCENTRIC SHAFTS	26M742	WYLE	4600-21-0305	2
R168 R177	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	2
R178	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
R118	RES, MF, 1/8W, 1%, 178K	RN55D-1783F	TRW	4701-03-1783	1
R164	RES, MF, 1/8W, 1%, 8.25K	RN55D-8251F	TRW	4701-03-8251	1
R189	RES, WW, 5W, 10%, 100	RS-5-100-10	DALE	4702-66-1000	1
CR22	DIODE	1N4148	FAIR	4807-02-6666	1
CR17	LED, RED	LN230RP	PANAS	4899-00-0042	1
S2	SWITCH PC	500-105	DUNCN	5199-00-0001	1
VR3	IC	LM317T	NSC	7000-03-1700	1
VR2	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 965 | ASSEMBLY NO. 1100-00-1893 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 965 / DWG NO 1100-00-1893 / REV A
	SCALE		CODE IDENT 23338 / SHEET 2 OF 2

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MAIN BOARD 967	0101-00-1896	WVTK	0101-00-1896	1
NONE	SCHEMATIC, MAIN BD	WVTK	0103-00	0103-00-1848	1
E1					1
NONE	ASSY DRWG, MAIN BOARD	0101-00-1848	WVTK	0101-00-1848	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, .005MF, 50V	CK-502	CRL	1500-05-0210	1
NONE	CAP, ELECT, 10MF/25V RADIAL LEAD, SP .10	CRE SERIES 10/25	CAPAR	1500-31-0002	1
NONE	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
NONE	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
NONE	CAP, ELECT, 220MF, 50V RADIAL LEAD	ULB1H221M	NICHC	1500-32-2103	1
NONE	CAP, TANT, 1MF, 35V	196D105X0035HA1	SPRAG	1500-71-0512	1
NONE	CAP, TANT, 220MF, 10V	196D227X9010TE4	SPRAG	1500-72-2701	1
NONE	CAP, TANT, 47MF, 20V	196D476X9020PE4	SPRAG	1500-74-7601	1
NONE	DRILL DRWG, MAIN BD	1700-00-1848	WVTK	1700-00-1848	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	HEADER	1-640386-0	AMP	2100-02-0079	1
NONE	CONN HEADER 3 PIN	640456-3	AMP	2100-02-0116	1
NONE	CONN, W/SHROUD, 12 PIN	AMP	102567-	2100-02-0166	1
NONE	CONN, RECPT, 13 PIN	643113-1	AMP	2100-02-0185	1
NONE	3 POS HEADER	22-10-2031	MOLEX	2100-03-0052	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
NONE	RELAY	CSW-5	HI-C	4500-00-0016	1
NONE	POT, TRIM, 20T, 10K	68WR10K	BECK	4609-90-0002	1
NONE	POT, TRIM, 20T, 20K	68WR20K	BECK	4609-90-0003	1
NONE	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
NONE	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
NONE	POT, TRIM, 20T, 5K	68WR5K	BECK	4609-90-0013	1
NONE	POT, TRIM, 20T, 100	68WR100	BECK	4609-90-0019	1
NONE	RES, C, 1/2W, 5%, 4.7	RC-1/2-4R7J	STKPL	4700-25-0479	1
NONE	RES, C, 1W, 5%, 43	RC32GF430J	AB	4700-35-0430	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
NONE	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
NONE	RES, MF, 1/8W, 1%, 11.5K	RN55D-1152F	TRW	4701-03-1152	1
NONE	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
NONE	RES, MF, 1/8W, 1%, 124K	RN55D-1243F	TRW	4701-03-1243	1
NONE	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
NONE	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
NONE	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
NONE	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	1
NONE	RES, MF, 1/8W, 1%, 17.4K	RN55D-1742F	TRW	4701-03-1742	1
NONE	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
NONE	RES, MF, 1/8W, 1%, 19.6K	RN55D-1962F	TRW	4701-03-1962	1
NONE	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1
NONE	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
NONE	RES, MF, 1/8W, 1%, 2.37K	RN55D-2371F	TRW	4701-03-2371	1
NONE	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
NONE	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
NONE	RES, MF, 1/8W, 1%, 2.87K	RN55D-2871F	TRW	4701-03-2871	1
NONE	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
NONE	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 3.16K	RN55D-3161F	TRW	4701-03-3161	1
NONE	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	1
NONE	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
NONE	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1
NONE	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
NONE	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
NONE	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 967 | DWG NO 1100-00-1896 | REV A
	SCALE		CODE IDENT 23338 | SHEET 1 OF 2

BISHOP GRAPHICS, INC. CUPRESS RECORDER NO. A1086

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REV	P N	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1
NONE	RES, MF, 1/8W, 1%, 604	RN55D-6040F	TRW	4701-03-6040	1
NONE	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
NONE	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
NONE	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
NONE	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
NONE	RES, MF, 1/8W, 1%, 9.09K	RN55D-9091F	TRW	4701-03-9091	1
NONE	RES, MF, 1/8W, 1%, 9.76K	RN55D-9761F	TRW	4701-03-9761	1
NONE	RES, MF, 1/4W, 1%, 619K	RN60D-6193F	TRW	4701-13-6193	1
NONE	RES, MF, 1/4W, 1%, 698K	RN60D-6983F	TRW	4701-13-6983	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	DIODE, ZENER 6.2V	1N823A	MOT	4801-01-0823	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	TRANS	2N3904	FAIR	4901-03-9040	1
NONE	TRANS	2N3906	FAIR	4901-03-9060	1
NONE	TRANS	2N5485	MOT	4901-05-4850	1
NONE	IC	OP-05CP	PMI	7000-00-0500	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	CROSS RECESS.				
4	WASHER, SPLIT LOCK, 4	#4SRLW	CMRCL	2800-42-4000	2
R21	POT, SWITCH, 1T, 50K	WYLE-26-M-075	AB	4600-05-0302	1
R131 R224	POT, 20T, 100K	43P104	SPECT	4600-11-0402	2
R195 R196	POT, DUAL, 10K, 5%, CERMET, CONCENTRIC SHAFTS	26M742	WYLE	4600-21-0305	2
R177	POT, TRIM, 20T, 2K	68WR2K	BECK	4609-90-0004	1
R168	POT, TRIM, 20T, 1K	68WR1K	BECK	4609-90-0005	1
R178	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
R118	RES, MF, 1/8W, 1%, 178K	RN55D-1783F	TRW	4701-03-1783	1
R164	RES, MF, 1/8W, 1%, 4.64K	RN55D-4641F	TRW	4701-03-4641	1
R189 R190	RES, WW, 5W, 10%, 100	RS-5-100-10	DALE	4702-66-1000	2
CR22	DIODE	1N4148	FAIR	4807-02-6666	1
CR17	LED, RED	LN230RP	PANAS	4899-00-0042	1
S2	SWITCH PC	500-105	DUNCN	5199-00-0001	1
VR3	IC	LM317T	NSC	7000-03-1700	1
VR2	VOLTAGE REGULATOR	LM337T	NAT	7000-03-3700	1

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC	OP-14CP	PMI	7000-00-1400	1
NONE	IC	TL084CN	TI	7000-00-8400	1
NONE	IC	TL188CN	TI	7000-01-8800	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC	LM399H	NSC	7000-03-9910	1
NONE	IC, PWR OP-AMP	LM13080	NSC	7000-13-0800	1
NONE	IC	CA-3039	RCA	7000-30-3900	1
NONE	IC	DG201CJ	SILX	8000-02-0101	1
P1	CONN, HEADER	1-640387-0	AMP	2100-02-0104	1
1	STANDOFF, SWAGE .125 H, .250 DIA4-40, .062 MAT'L	9531B-0440-3A	AMTOM	2800-03-0004	2
6	PLUG BUTTON	PC47291	UNCAR	2800-09-0010	1
W5	JUMPER .05	2800-12-0048	WVTK	2800-12-0048	1
2	WASHER, FLAT, 4(.312 O.D.)	#4FW	CMRCL	2800-26-4000	2
5	SHAFT ADAPTER, POT	6-1-2	SPECT	2800-32-0003	2
3	SCREW, PAN, CAD I,	MS51957-13	COML	2800-38-4104	2

WAVETEK PARTS LIST | TITLE: PCA, MAINBOARD MODEL 967 | ASSEMBLY NO. 1100-00-1896 | REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MAIN BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 967 / DWG NO 1100-00-1896 / REV A
	SCALE		CODE IDENT 23338 / SHEET 2 OF 2

BOHUN GRAPHICS, A.T. PRESS REORDER NO. A37008

REV	ECN	BY	DATE	APPV
A	RELEASED	AS	7-85	AS

ADCLOCK
C68 .1
+6.3V
GND1
TP17 +2.5_REF
+6.3V
R231 2K
C29 .1
CR11 1N748 3.9V
U15E U15D
C28 200 pf
R68 10K
R6910K
A70 10K
U12 ADC1021 10 BIT A/D
R/C VIN+ VIN- A_GND R VREF VCC MSB LSB GND CS WR RD INTR
-13V
R216 100K
CW
R217 499K
R218 499
+13V
MARKER ZERO POINT ADJUST
GND2
U28 74HC138
A0 A1 A2 E1 E2 E3
MKASET
SWEEPBUF
M3
M2
M1
J16-12
J15-1
J16-10
J16-5
J16-11
+2.5_REF
C32 10/20V TANT
TP18 -10V_REF
J16-1 +10_BUFF
R71 2K
R72 80.5
R73 576
R76 200. 20T
CW MARKER TRACKING ADJUST
C30 .1
R74 10K
10K R75
U30B LM348 1/4
C31 10/20V TANT
-10V_REF
J16-6 -10V_REF (OUTPUT)
R215 10K
R214 F.S.
R87 NOM. 221K
R81 R82 R83 237K, 3 PLCS
M1_OUT M2_OUT M3_OUT
J15-9 BUF_TUNE
J16-8 STARTFRQ
R84 R85 R86 237K, 3 PLCS
DELTA F GAIN
R89 20 T 100K
CW DELTA F OFFSET
R88 50K 20 T
R90 200K
U13 DG508 ANALOG MULTIPLEX
S1 S2 S3 S4 S5 S6 S7 S8 A2 A1 A0 D EN GND V+ V-
J16-3 DM3
J16-9 DM2
J16-4 DM1
J16-2 STOPFRQ
C67 .1
C66 .1
+13V -13V
DISPLAY MULTIPLEX

SUPPLY CONNECTOR PINS
GND1 -- J15-5, J15-11
GND2 -- J15-3
+13V -- J15-12
-13V -- J15-2, J15-8
+6.3V -- J15-10, J15-4
V+BAT -- J15-6

MARKER 3
V+BAT
C69 .1
GND1
TP19 M3_OUT
U14 DAC1006 10 BIT D/A
VREF VCC RFB MSB LSB IOUT2 IOUT1 B1/B2 CS WR XFER GND
M3D ADCLOCK MKASET M3 M3_OUT
+13V
C82 .1
GND2
U30A 1/4 LM348
-13V
C83 .1
C36 .1
C84 .1
U29C 1/4 LM339 COMPARATOR
1/6 CD4049
U15B
C33 .001
MARKER DURATION
CW
A213 20K, 20T
TP22 MARKERS
+10_BUFF
R80 30.1K
R79 20K
C100 330PF
R77 6.81K
U29B 1/4 LM339 COMPARATOR
J15-7 MARKERS
T=100E-6 SEC.

MARKER 2
V+BAT
C70 .1
GND1
TP20 M2_OUT
U16 DAC1006 10 BIT D/A
VREF VCC RFB MSB LSB IOUT2 IOUT1 B1/B2 CS WR XFER GND
M2D MKASET ADCLOCK SWEEPBUF M2_OUT M2
U30D 1/4 LM348
C37 .1
+6.3V
R78 100K
U29A 1/4 LM339 COMPARATOR
C34 .001
U15A
1/6 CD4049

MARKER 1
C71 .1
V+BAT
GND1
TP21 M1_OUT
U17 DAC1006 10 BIT D/A
VREF VCC RFB MSB LSB IOUT2 IOUT1 B1/B2 CS WR XFER GND
M1D MKASET ADCLOCK M1_OUT M1 DISPLAY
U30C 1/4 LM348
C38 .1
U29D 1/4 LM339 COMPARATOR
C35 .001
U15F
1/6 CD4049
J16-7 DISPLAY

DRAWN BY	DATE
C. KREHBIEL	8-14-84
PROJ ENGR	7-85
RELEASE APPROVAL	7/25/85

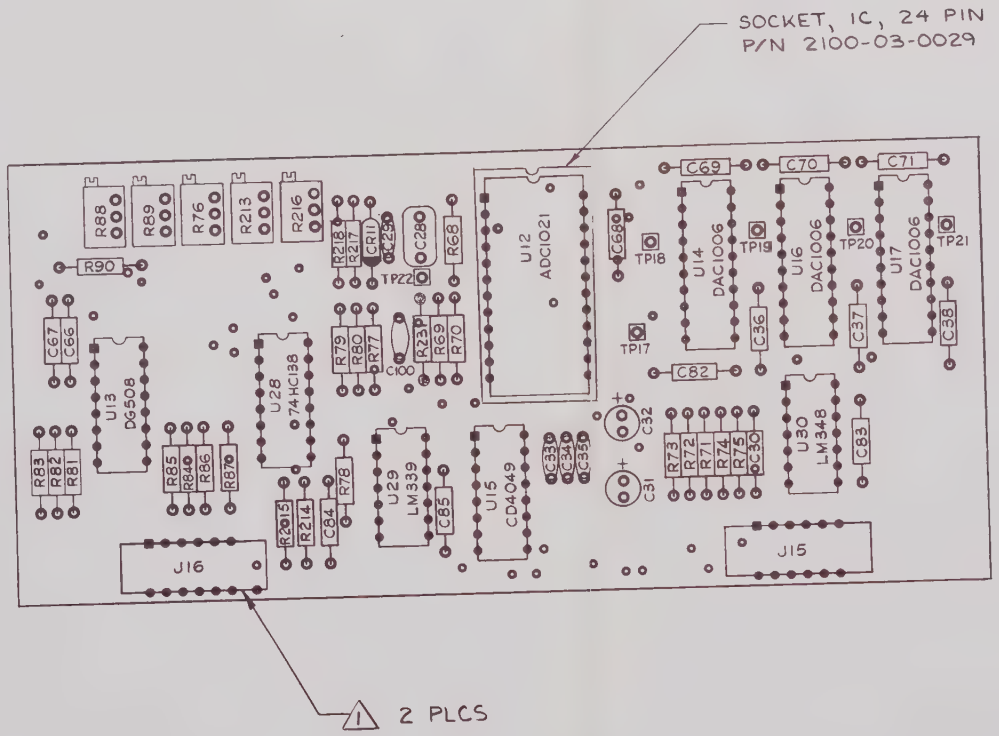
WAVETEK SAN DIEGO, CALIFORNIA

TITLE
MARKER CONTROL CIRCUITS

MODEL NO.	DRAWING NUMBER	REV
960 SERIES	0103-00-1854	A
CODE IDENT 23338	SHEET 1 OF 1	

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY REASON EXCEPT CALIBRATION, OPERATION, AND MAINTENANCE WITHOUT WRITTEN AUTHORIZATION

REV	ECN	BY	DATE	APP
B	4963	AS	8-85	AS



⚠1. CONNECTOR RECEPTACLES SHOULD BE INSTALLED TO PERMIT MATING CONNECTORS ENTRY FROM BOTTOM EDGE OF BOARD.

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L QUIJENCIO 2/28/85	WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL —	PROJ ENGR 5/85	TITLE ASSEMBLY, MARKER BD	
FINISH WAVETEK PROCESS —	RELEASED 5/14/85	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030	DO NOT SCALE DWG
	SCALE 2:1	MODEL NO 960 SERIES	DWG NO 0101-00-1854 REV B
	CODE IDENT 23338	SHEET 1 OF 1	

0101-00-1854

BISHOP GRAPHICS ACCUPRESS REORDER NO. A 3894

REV.	ECN	BY	DATE	APP.
A	RELEASED	AS	7/85	AS
B	4964	QB	9/26/85	AS

WAVEFORM GENERATOR

+10_BUFF — J18-4, J18-10 — C12 100 25V — GND1

R17 499 — +13V

R18 100 — 1/5 CA3096 PNP — 10 — 11 — U33C — 12

R20 9.53K — R23 200 20T CW RATE RANGE — R24 499 — C13 .01 — GND1

C86 .1 — +13V — GND1 — U32C 1/4 TL084CN — 8 — 9 — 10 — C87 .1 — -13V — GND1

R25 51.1 — J18-7

50K R21 — CW — GND1 — RATE CONTROL MAIN CIRCUIT BOARD

+10_BUFF

CW_LITE — J18-8

R26 100

1/5 CA3096 PNP — 13 — 14 — U33D — 15

TP37 GEN_OUT

+10_BUFF — +13V — C96 .1 — R219 200 — .1 C101 — GND1

U32A 1/4 TL084CN — 3 — 2 — 1

+13V — U36 VIN REF-01 VOUT — 2 — 6 — 10.0V — GND — 4 — C104 .1 — GND1

Vcc U26 — CTRL — OUT — 5 — 3 — NE555 — RESET — THR — 4 — 6 — TRIG — DCHG — 2 — 7 — GND — 1 — GND1

R220 500 CW — R221 4.02K — R37 249 — GND1 — CR6 1N748A

R98 20K — R99 100K — RAMP TOP FLAT ADJUST

SWEEP SHAPER

+13V — .1 C74 — GND1 — 1/4 LM348 U35D — 12 — 13 — 4 — 14 — 11 — C75 .1 — GND1 — -13V

CR4

C14 .001 — GND1

+10_BUFF — R27 10K — R28 CW 1K, 1T WAVEFORM ADJUST — R29 16.5K

CW_LITE — R100 100K — R94 100K — R93 49.9K — R97 30.1K

COMPARATOR LM339 1/4 U34D — 8 — 14 — 9

CR12 — R95 18.2K — +13V — R96 2.21K — GND1

+13V — C18 100 pf — R100 1M — R101 1M — CR14 — GND1

+13V — COMPARATOR LM339 1/4 U34B — 4 — 5 — 2 — R103 20K — R104 100K — R102 1M — CR13 — C39 .01 MYLAR, 10% — GND1

R105 100K — R106 1K — GND1

+10_BUFF — R31 3.65K — R33 6.19K — R34 1K — TP10 SWEEPOUT — J17-10 — SWEEPOUT

U35A 1/4 LM348 — 3 — 2 — 1 — CR5

R30 OPEN — GND1

+13V — R91 100K — R92 20K — GND1 — C76 .1 — U34C 1/4 LM339 COMPARATOR — 3 — 13 — 12 — 11 — 10 — +10_BUFF

C17 .002 — GND1

BLANKING PULSE GENERATOR

+13V — +6.3V — U31 — V_{CC} — V_{LL} — TL188 — A LO — S1 — S2 — D1 — D2 — V_{EE} — Vref — 6 — 7 — 5 — 4 — 11 — 3 — 12 — 9 — 8

R35 10K — R36 10K — GEN_OUT — C15 .001

-13V — GND1

C16 10 20V TANT — GND1

TRIGGER CONTROL

EXT† — J18-5

TRIGGER — J18-6

MARKERS — J17-1

CONNECTOR SUPPLY PINS

GND1 - J17-5, J17-11
GND2 - J17-3, J17-9
-13V - J17-2, J17-8
+13V - J17-6, J17-12
+6.3V - J17-4

+10_BUFF — R38 221K — TP9 BLANK — COMPARATOR LM339 1/4 U34A — 6 — 7 — 1

R40 1K — GND1

+6.3V — R42 20K — GND1 — R43 10K

S1-5 — S1-4 — S1-3 — S1-2

+2 AXIS BLANKING: CLOSE S1-5, S1-2
-2 AXIS BLANKING: CLOSE S1-3, S1-4

4.99K R44 — 10K R45 — 10K R46 — R211 100K

U35B 1/4 LM348 — 5 — 6 — 7

U35C 1/4 LM348 — 10 — 9 — 8 — R209 100 — J18-11 — SWEEP

TP11 BLANKING, PEN LIFT, INTENSITY MARKERS

J17-7 — Z_AXIS

-13V — R210 20K 1T — +13V — Z-AXIS DC OFFSET

DRAWN BY: C. KREHBIEL	DATE: 8-13-84	WAVETEK SAN DIEGO, CALIFORNIA	
PROJ ENGR: al Stark	9/85	TITLE: BASIC SWEEP WAVEFORM GENERATOR	
RELEASE APPROV:	9/85	MODEL NO.: 960 SERIES	DRAWING NUMBER: 0103-00-1875
CODE IDENT: 23338		SHEET 1 OF 1	REV: B

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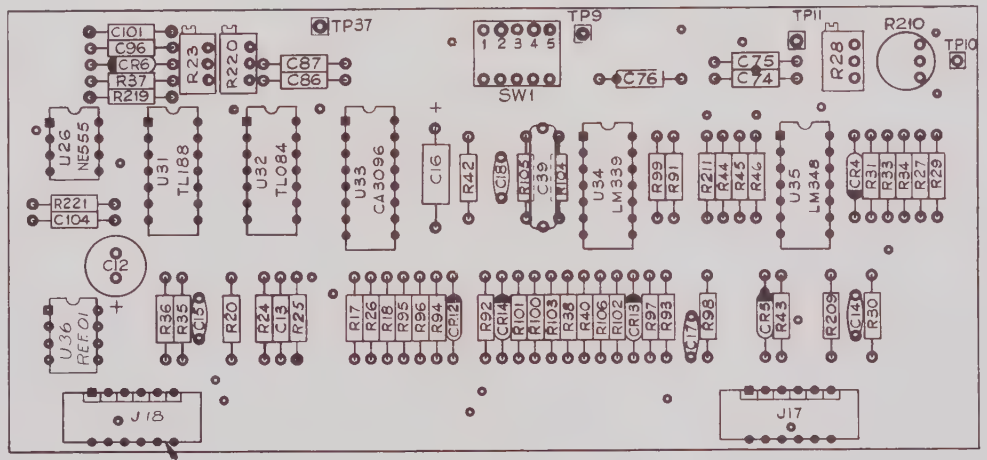
REV	ECN	BY	DATE	APP
A	RELEASED	AS	5/85	AS
B	4964	JB	9/24/85	AS
C	7563	AS	6/86	AS



⚠1 TYP 2 PLCS

⚠1. CONNECTOR RECEPTACLES SHOULD BE INSTALLED TO PERMIT MATING CONNECTORS ENTRY FROM BOTTOM EDGE OF BOARD.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L QUIJENCIO	DATE 3/11/85	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL —	PROJ ENGR	5/85	TITLE ASSEMBLY, WAVE-GEN BD
FINISH WAVETEK PROCESS —	APPROVED 6/20/85	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030	
	DO NOT SCALE DWG	SCALE 2:1	MODEL NO 960 SERIES / DWG NO 0101-00-1875 / REV C
			CODE IDENT 23338 / SHEET 1 OF 1

0101-00-1875

BISHOP GRAPHICS ALCUPRESS REORDER NO. A 3894

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MARKER BD	0101-00-1854	WVTK	0101-00-1854	1
NONE	ASSY DRWG, MARKER BD	0101-00-1854	WVTK	0101-00-1854	1
NONE	SCHEMATIC, MARKER WAVEFORM BD	WVTK	0103-00	0103-00-1854	1
NONE	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, 220PF, 1KV	DD-221	CRL	1500-02-2111	1
NONE	CAP, CER, 330PF, 1KV	DD-331	CRL	1500-03-3111	1
NONE	CAP, TANT, 22MF, 20V	202A2002226M3	MATSO	1500-72-2621	1
NONE	DRILL DRWG, MARKER BD	1700-00-1854	WVTK	1700-00-1854	1
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	POT, 20T, TRIM, 20K	6BXR20K	BECK	4609-90-0011	1
NONE	POT, 20T, TRIM, 100K	6BXR100K	BECK	4609-90-0012	1
NONE	POT, TRIM, 20T, 50K	6BXR50K	BECK	4609-90-0016	1
NONE	POT, TRIM, 20T, 200	6BXR200	BECK	4609-90-0018	1
NONE	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1

WAVETEK PARTS LIST	TITLE: ASSY, MARKER BOARD	ASSEMBLY NO. 1100-00-2220	REV A
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1
NONE	RES, MF, 1/8W, 1%, 200K	RN55D-2003F	MEPCO	4701-03-2003	1
NONE	RES, MF, 1/8W, 1%, 221K	RN55D-2213F	TRW	4701-03-2213	1
NONE	RES, MF, 1/8W, 1%, 237K	RN55D-2373F	TRW	4701-03-2373	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 576	RN55D-5760F	TRW	4701-03-5760	1
NONE	RES, MF, 1/8W, 1%, 6.81K	RN55D-6811F	TRW	4701-03-6811	1
NONE	RES, MF, 1/8W, 1%, 82.5	RN55D-82R5F	TRW	4701-03-8259	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	IC	MLM339P	MOT	7000-03-3900	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC, LIN, CMOS, SP SW ARRAY	DG508ACJ	SLCON	7000-05-0800	1

WAVETEK PARTS LIST	TITLE: ASSY, MARKER BOARD	ASSEMBLY NO. 1100-00-2220	REV A
		PAGE 2	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	IC, DAC	DAC1006LCN	NAT	7000-10-0600	1
NONE	IC	CD4049UBE	RCA	8001-40-4900	1
NONE	IC, 1 OF 8 DECODER/ DEMULTIPLEXER	B007-41-3811	WVTK	8007-41-3840	1
J15 J16	CONN, RCPT, DIP, 12 PIN	AMP	102584-	2100-02-0167	2
R218	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
R217	RES, MF, 1/8W, 1%, 499K	RN55D-4993F	TRW	4701-03-4993	1
U12	IC, LIN CONVERTER A/D, 10 BIT	ADC1021CCJ	NSC	7000-10-2100	1

WAVETEK PARTS LIST	TITLE: ASSY, MARKER BOARD	ASSEMBLY NO. 1100-00-2220	REV A
		PAGE 3	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, MARKER BOARD
	RELEASE APPROV		
FINISH VIAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 960	DWG NO 1100-00-2220 REV A
	SCALE	CODE IDENT 23338	SHEET OF

B SHOP GRAPHICS ACCUPRESS REORDER NO. A2706

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MARKER BD	0101-00-1854	WVTK	0101-00-1854	1
NONE	SCHEMATIC, MARKER WAVEFORM BD	WVTK	WVTK	0103-00 0103-00-1854	1
C33 C34 C35	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	3
C29 C30 C36 C37 C38 C66 C67 C68 C69 C70 C71 C82 C83 C84 C85	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	15
C28	CAP, CER, 220PF, 1KV	DD-221	CRL	1500-02-2111	1
C100	CAP, CER, 330PF, 1KV	DD-331	CRL	1500-03-3111	1
C31 C32	CAP, TANT, 22MF, 20V	202A2002226M3	MATSO	1500-72-2621	2
NONE	DRILL DRWG, MARKER BD	1700-00-1854	WVTK	1700-00-1854	1
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	1
TP17 TP18 TP19 TP20 TP21 TP22	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	6
R213	POT, 20T, TRIM, 20K	6BXR20K	BECK	4609-90-0011	1
R216 R89	POT, 20T, TRIM, 100K	6BXR100K	BECK	4609-90-0012	2
R88	POT, TRIM, 20T, 50K	6BXR50K	BECK	4609-90-0016	1
R76	POT, TRIM, 20T, 200	6BXR200	BECK	4609-90-0018	1
R218	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD MARKER BOARD	1208-00-1854	
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R215 R68 R69 R70 R74 R75	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	6
R78	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
R217	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
R231 R71	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	2
R79	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1
R90	RES, MF, 1/8W, 1%, 200K	RN55D-2003F	MEPCO	4701-03-2003	1
R87	RES, MF, 1/8W, 1%, 221K	RN55D-2213F	TRW	4701-03-2213	1
R81 R82 R83 R84 R85 R86	RES, MF, 1/8W, 1%, 237K	RN55D-2373F	TRW	4701-03-2373	6
R80	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
R73	RES, MF, 1/8W, 1%, 576	RN55D-5760F	TRW	4701-03-5760	1
R77	RES, MF, 1/8W, 1%, 6.81K	RN55D-6811F	TRW	4701-03-6811	1
R72	RES, MF, 1/8W, 1%, 82.5	RN55D-82R5F	TRW	4701-03-8259	1
CR11	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
U29	IC	MLM339P	MOT	7000-03-3900	1
U30	IC	LM348N	NSC	7000-03-4800	1
U13	IC, LIN, CMOS, SP SW ARRAY	DG508ACJ	SLCON	7000-05-0800	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD MARKER BOARD	1208-00-1854	
		PAGE 2	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
U14 U16 U17	IC, DAC	DAC1006LCN	NAT	7000-10-0600	3
U15	IC	CD4049UBE	RCA	8001-40-4900	1
U28	IC, 1 OF 8 DECODER/ DEMULTIPLEXER	8007-41-3811	WVTK	8007-41-3840	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD MARKER BOARD	1208-00-1834	
		PAGE 3	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PRE-WAVE MARKER BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 960 / DWG NO 1208-00-1854 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	PCA ASSY, WAVEFORM GEN BD	0101-00-1875	WVTK	0101-00-1875	1
NONE	PCA ASSY, WAVEFORM GEN BD	0101-00-1875	WVTK	0101-00-1875	1
NONE	SCHEMATIC, WAVEFORM GEN BD	0103-00-1875	WVTK	0103-00-1875	1
NONE	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	1
NONE	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	1
NONE	CAP, CER, MN, .01MF, 50V	GE50-103ZA	MURAT	1500-01-0310	1
NONE	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	1
NONE	CAP, CER, .0022, 1KV	DD-222SLL	CRL	1500-02-2201	1
NONE	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
NONE	CAP, MYLAR, .01MF, 100V	225P10391WD3	SPRAG	1500-41-0314	1
NONE	CAP, TANT, 10MF, 20V	150D106X9020B2	SPRAG	1500-71-0601	1
NONE	DRILL, WAVEFORM GEN BD	1700-00-1875	WVTK	1700-00-1875	1
NONE	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	1
NONE	POT, TRIM, 20K	91AR20K	BECK	4600-02-0301	1

WAVETEK PARTS LIST | TITLE: ASSY, WAVEFORM GENERATOR BOARD | ASSEMBLY NO. 1100-00-2221 | REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	POT, TRIM, 20T, 1K	6BXR1K	BECK	4609-90-0015	1
NONE	POT, TRIM, 20T, 200	6BXR200	BECK	4609-90-0018	1
NONE	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
NONE	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	1
NONE	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
NONE	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
NONE	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	1
NONE	RES, MF, 1/8W, 1%, 16.5K	RN55D-1652F	TRW	4701-03-1652	1
NONE	RES, MF, 1/8W, 1%, 18.2K	RN55D-1822F	TRW	4701-03-1822	1
NONE	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
NONE	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	1
NONE	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
NONE	RES, MF, 1/8W, 1%, 221K	RN55D-2213F	TRW	4701-03-2213	1
NONE	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
NONE	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
NONE	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	1
NONE	RES, MF, 1/8W, 1%, 4.02K	RN55D-4021F	TRW	4701-03-4021	1

WAVETEK PARTS LIST | TITLE: ASSY, WAVEFORM GENERATOR BOARD | ASSEMBLY NO. 1100-00-2221 | REV

PAGE 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
NONE	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
NONE	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
NONE	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1
NONE	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
NONE	RES, MF, 1/8W, 1%, 9.53K	RN55D-9531F	TRW	4701-03-9531	1
NONE	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
NONE	DIODE	1N4148	FAIR	4807-02-6666	1
NONE	VOLTAGE REFERENCE, +10V, 8-PIN DIP	REF-01CP	PMI	7000-00-0102	1
NONE	IC	TL084CN	TI	7000-00-8400	1
NONE	IC	TL188CN	TI	7000-01-8800	1
NONE	IC	MLM339P	MOT	7000-03-3900	1
NONE	IC	LM348N	NSC	7000-03-4800	1
NONE	IC	LM555CN	NSC	7000-05-5500	1
NONE	IC	CA-3096AE	RCA	7000-30-9600	1
J17 J18	CONN, RCPT, DIP, 12	102584-2	AMP	2100-02-0167	2

WAVETEK PARTS LIST | TITLE: ASSY, WAVEFORM GENERATOR BOARD | ASSEMBLY NO. 1100-00-2221 | REV

PAGE 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
S1	PIN SWITCH PC	500-105	DUNCN	5199-00-0001	1

WAVETEK PARTS LIST | TITLE: ASSY, WAVEFORM GENERATOR BOARD | ASSEMBLY NO. 1100-00-2221 | REV

PAGE 4

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES | MATERIAL | FINISH WAVETEK PROCESS | DRAWN | DATE | PROJ ENGR | RELEASE APPROV | TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030 | DO NOT SCALE DWG | SCALE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE: PARTS LIST ASSY, WAVEFORM GEN

MODEL NO 960 | DWG NO 1100-00-2221 | REV

CODE IDENT 23338 | SHEET OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A2706

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	PCA ASSY, WAVEFORM GEN BD	0101-00-1875	WVTK	0101-00-1875	1
NONE	SCHEMATIC, WAVEFORM GEN BD	0103-00-1875	WVTK	0103-00-1875	1
C18	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	1
C14 C15	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	2
C13	CAP, CER, MN, .01MF, 50V	QE50-103ZA	MURAT	1500-01-0310	1
C101 C104 C74 C75 C76 C77 C86 C87 C96	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	9
C17	CAP, CER, .0022, 1KV	DD-222SLL	CRL	1500-02-2201	1
C12	CAP, ELECT, 100MF, 25V RADIAL LEAD, SP .20	ULB1V101M	NICH	1500-31-0102	1
C39	CAP, MYLAR, .01MF, 100V	225P10391WD3	SPRAG	1500-41-0314	1
C16	CAP, TANT, 10MF, 20V	150D106X9020B2	SPRAG	1500-71-0601	1
NONE	DRILL, WAVEFORM GEN BD	1700-00-1875	WVTK	1700-00-1875	1
TP10 TP11 TP37 TP9	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	4
R210	POT, TRIM, 20K	91AR20K	BECK	4600-02-0301	1
R28	POT, TRIM, 20T, 1K	68XR1K	BECK	4609-90-0015	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD WAVEFORM GENERATOR BD	1208-00-1875	
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R23	POT, TRIM, 20T, 200	68XR200	BECK	4609-90-0018	1
R18 R209 R26	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	3
R106 R34 R40	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	3
R27 R35 R36 R43 R45 R46	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	6
R104 R105 R211 R91 R94 R99	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	6
R100 R101 R102	RES, MF, 1/8W, 1%, 1M	RN55D-1004F	TRW	4701-03-1004	3
R29	RES, MF, 1/8W, 1%, 16.5K	RN55D-1652F	TRW	4701-03-1652	1
R95	RES, MF, 1/8W, 1%, 18.2K	RN55D-1822F	TRW	4701-03-1822	1
R219	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
R103 R42 R92 R98	RES, MF, 1/8W, 1%, 20K	RN55D-2002F	TRW	4701-03-2002	4
R96	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	1
R38	RES, MF, 1/8W, 1%, 221K	RN55D-2213F	TRW	4701-03-2213	1
R220 R37	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	2
R97	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
R31	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	1
R221	RES, MF, 1/8W, 1%, 4.02K	RN55D-4021F	TRW	4701-03-4021	1
R17 R24	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	2

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD WAVEFORM GENERATOR BD	1208-00-1875	
		PAGE 2	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R44	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R93	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R25	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1
R33	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
R20	RES, MF, 1/8W, 1%, 9.53K	RN55D-9531F	TRW	4701-03-9531	1
CR6	DIODE, ZENER, 3.9V	1N748A	FAIR	4801-01-0748	1
CR12 CR13 CR14 CR4 CR5	DIODE	1N4148	FAIR	4807-02-6666	5
U36	VOLTAGE REFERENCE, +10V, 8-PIN DIP	REF-01CP	PMI	7000-00-0102	1
U32	IC	TL084CN	TI	7000-00-8400	1
U31	IC	TL188CN	TI	7000-01-8800	1
U34	IC	MLM339P	MOT	7000-03-3900	1
U35	IC	LM348N	NSC	7000-03-4800	1
U26	IC	LM555CN	NSC	7000-05-5500	1
U33	IC	CA-3096AE	RCA	7000-30-9600	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	PRE-WAVE LOAD WAVEFORM GENERATOR BD	1208-00-1875	
		PAGE 3	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST PRE-WAVE WAVEFORM GEN
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 960
	DO NOT SCALE DWG		DWG NO 1208-00-1875 REV
	SCALE		CODE IDENT 23338 SHEET OF

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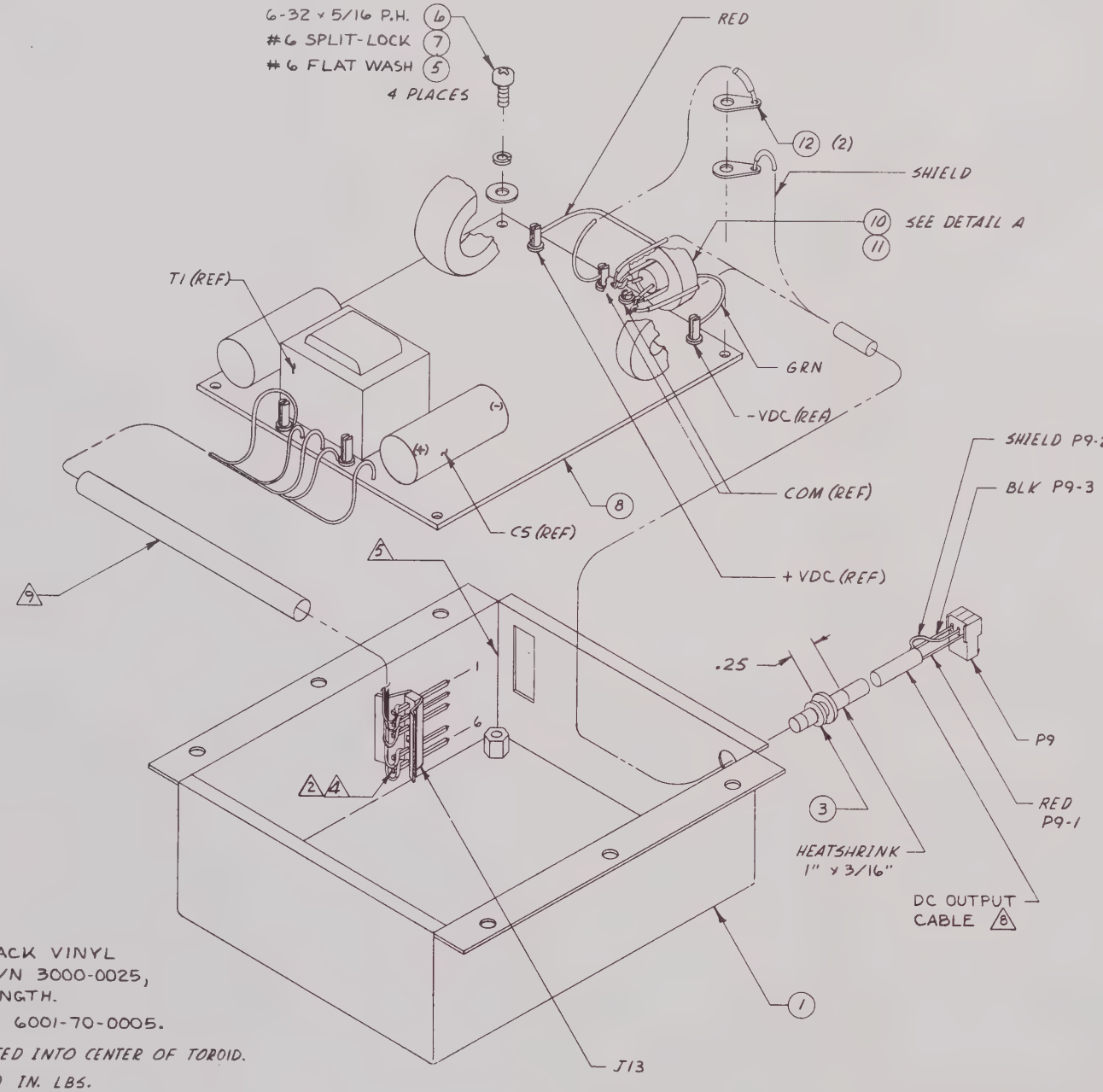
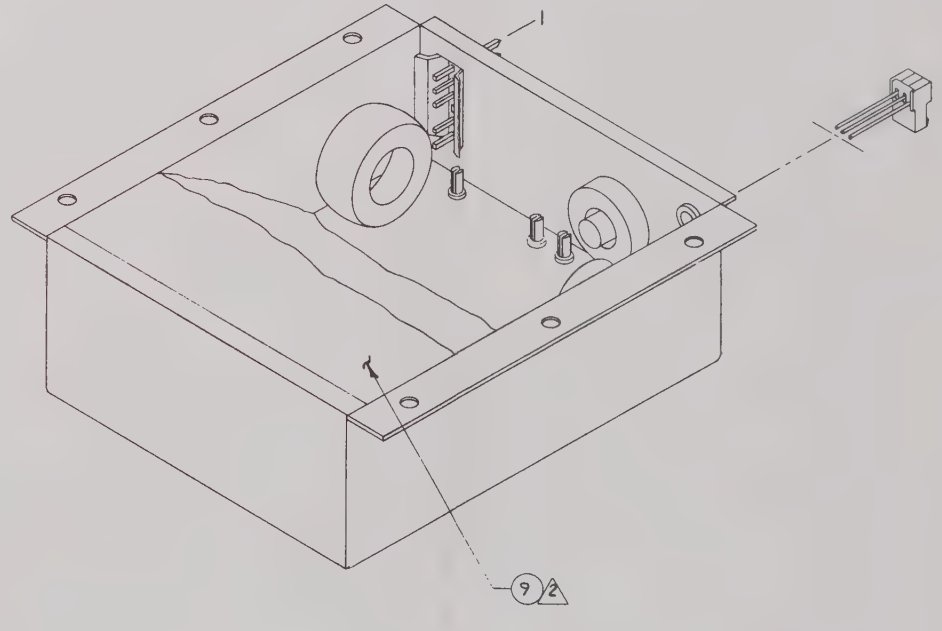
REV	ECN	BY	DATE	APP





(9) COVER WITH BLACK VINYL SLEEVING #4 P/N 3000-0025, 6 INCHES IN LENGTH.

(5) CABLE ASSY P/N 6001-70-0005.

(7) CAPACITOR IS INSERTED INTO CENTER OF TOROID.

(6) DO NOT EXCEED 10 IN. LBS. TORQUE OR IRREPARABLE DAMAGE TO COVER WILL RESULT.

(5) SEAL ALL CORNERS AND OPENINGS WITH SEALANT. REFERENCE POTTING PROCEDURE 0005-00-1178

(4) PINS TO BE CUT .25 IN FROM CONNECTOR AND WIRED TO DRESS VERTICALLY AND CLOSE TO CONNECTOR. REMOVE PIN 4.

3. ALL WIRE IS 22 AWG, UL 1430.

(2) SEE ASSEMBLY PROCEDURE 0005-00-1178.

1. REFERENCE PARTS LIST 1101-00-1178.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN M Hansen	DATE 4/25/83	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR J Patel	DATE 4/29/83	TITLE ASSY POWER SUPPLY
FINISH WAVETEK PROCESS	MFG ENGR APPROV [illegible]	DATE 5/11/84	
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 950 SERIES
	SCALE NONE		DWG NO 0102-00-1178 REV A
			CODE IDENT 23338 SHEET 1 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3884

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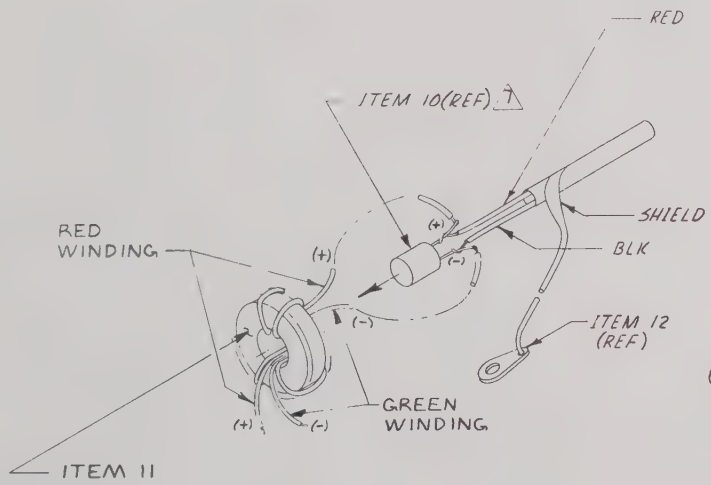
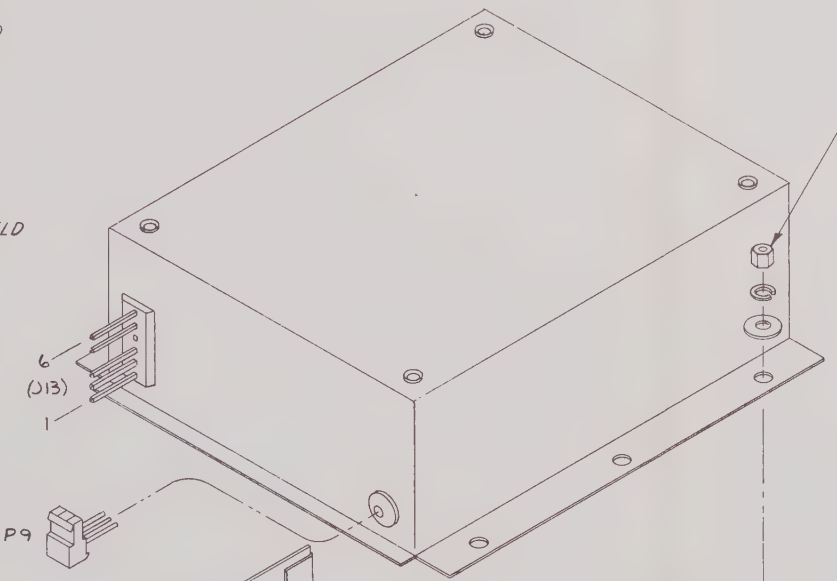
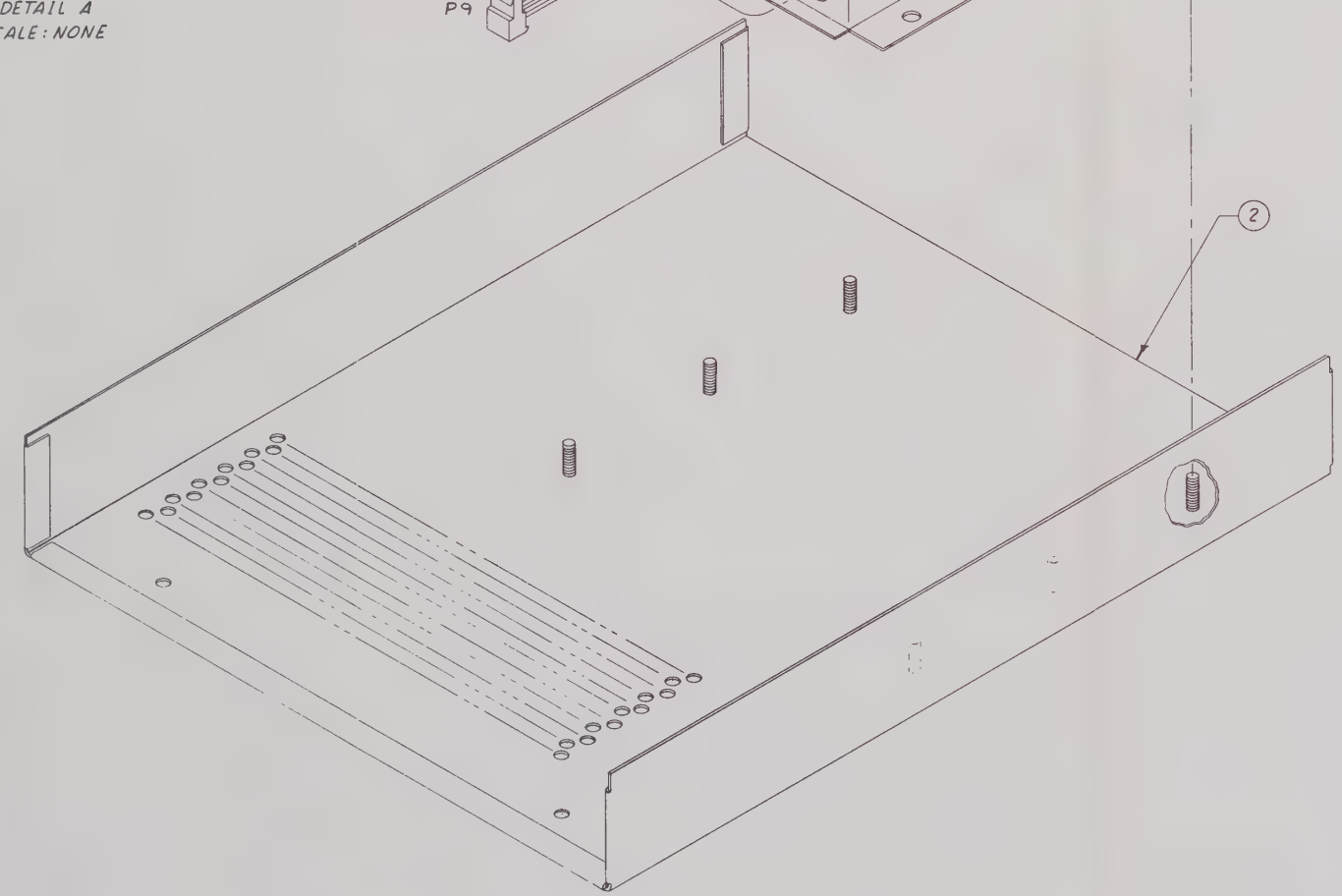
REV	FCN	BY	DATE	APP

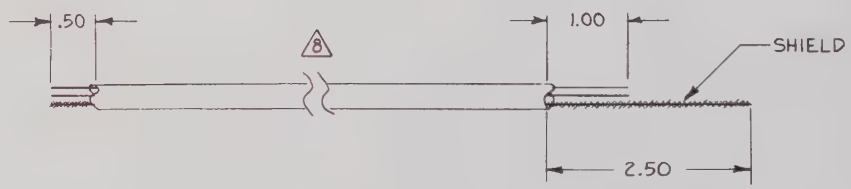


DETAIL A
SCALE: NONE





6 CAUTION
(4) 6-32 HEX NUT
(7) #6 SPLIT-LOCK
(5) #6 FLAT WASH
6 PLACES



WIRE TABLE					
FROM	TERM.	TO	TERM	COLOR	LENGTH
J13-1	.12 STRIP	T1-1	.12 STRIP	BRN	8 IN
J13-2	↕	T1-2	↕	RED	↕
J13-3	↕	T1-3	↕	ORN	↕
J13-5	↕	T1-4	↕	GRN	↕
J13-6	.12 STRIP	J1/CS(+)	↕	BLU	8 IN
P9-1		ITEM 10+	↕	RED	9 IN
P9-2		ITEM 12	↕	SHIELD	9 IN
P9-3		ITEM 10-	↕	BLK	9 IN
COM	.12 STRIP	ITEM 12	↕	BLK	2.5 IN
VDC+	.12 STRIP	ITEM 11	↕		2 IN
VDC-	.12 STRIP	ITEM 11	.12 STRIP		.5 IN
ITEM 10+	NONE	ITEM 11+	NONE		.5 IN
ITEM 10-	NONE	ITEM 11-	NONE		.5 IN

8

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN M Hansen	DATE 1/4/83	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSY POWER SUPPLY
	RELEASE APPROV	5/11/83	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 950 SERIES / DWG NO 0102-00-1178 / REV A
	SCALE NONE		CODE IDENT 23338 / SHEET 2 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3884

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	POTTING PROCEDURE	0005-00-1178	WVTK	0005-00-1178	1
NONE	ASSY DRWG, POWER SUPPLY	0102-00-1178	WVTK	0102-00-1178	1
2	TOP COVER	952-7272	WVTK	1400-01-7272	1
2	STUD, PRESS 6-32X1/4	CHC-632-4	PEM	2800-12-0042	1
1	HOUSING P.S.	952-7262	WVTK	1400-01-7262	1
1	STANDOFF, SWAGE .250 H, .250 HEX6-32, .031 MAT'L	1531A-1/4-11	USECO	2800-02-0001	1
10	CAP, ELECT, 47MF, 50V RADIAL LEAD, SP .20	ULB1J470M	NICH	1500-34-7003	1
9	EPOXY CASTING RESIN	301A	CASTL	1600-99-0003	26
NONE	HARDENER	E-34	CASTL	1600-99-0004	2
P9	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
12	LUG, GROUND	5413-30	SESTM	2100-04-0040	2
J13	HEADER, 6 PIN CHASSIS MOUNT	09-57-1065	MOLEX	2100-05-0058	1
3	GROMMET, RUBBER	2172	SMITH	2800-10-0006	1
4	NUT, HEX, CAD PLATE 6-32	MS35649-264	COML	2800-14-6100	6

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, POWER SUPPLY	1101-00-1178	B
		PAGE 1	

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
5	WASHER, FLAT, 6(.375 O.D.)	6 SAE FLAT WASHER	CMRCL	2800-26-6000	10
6	SCREW, PAN, CAD I CROSS RECESS,	6-32X 5/16 PAN	CMRCL	2800-38-6105	4
7	WASHER, SPLIT LOCK #6 6	#6SRLW	CMRCL	2800-42-6000	10
8	PWR SUPPLY, +-15V SWITCHING	2050-3A	PDGEN	3000-00-0128	1
NONE	EMI LINE FILTER, TORROID	5600-00-0042	WVTK	5600-00-0042	1
11	CORE	T80-26	MCMTL	5600-07-0014	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, POWER SUPPLY	1101-00-1178	B
		PAGE 2	

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, POWER SUPPLY
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 960 / DWG NO 1101-00-1178 / REV B
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET / OF
	SCALE		

B SHOP GRAPH CS/ACCUPRESS REORDER NO A2786

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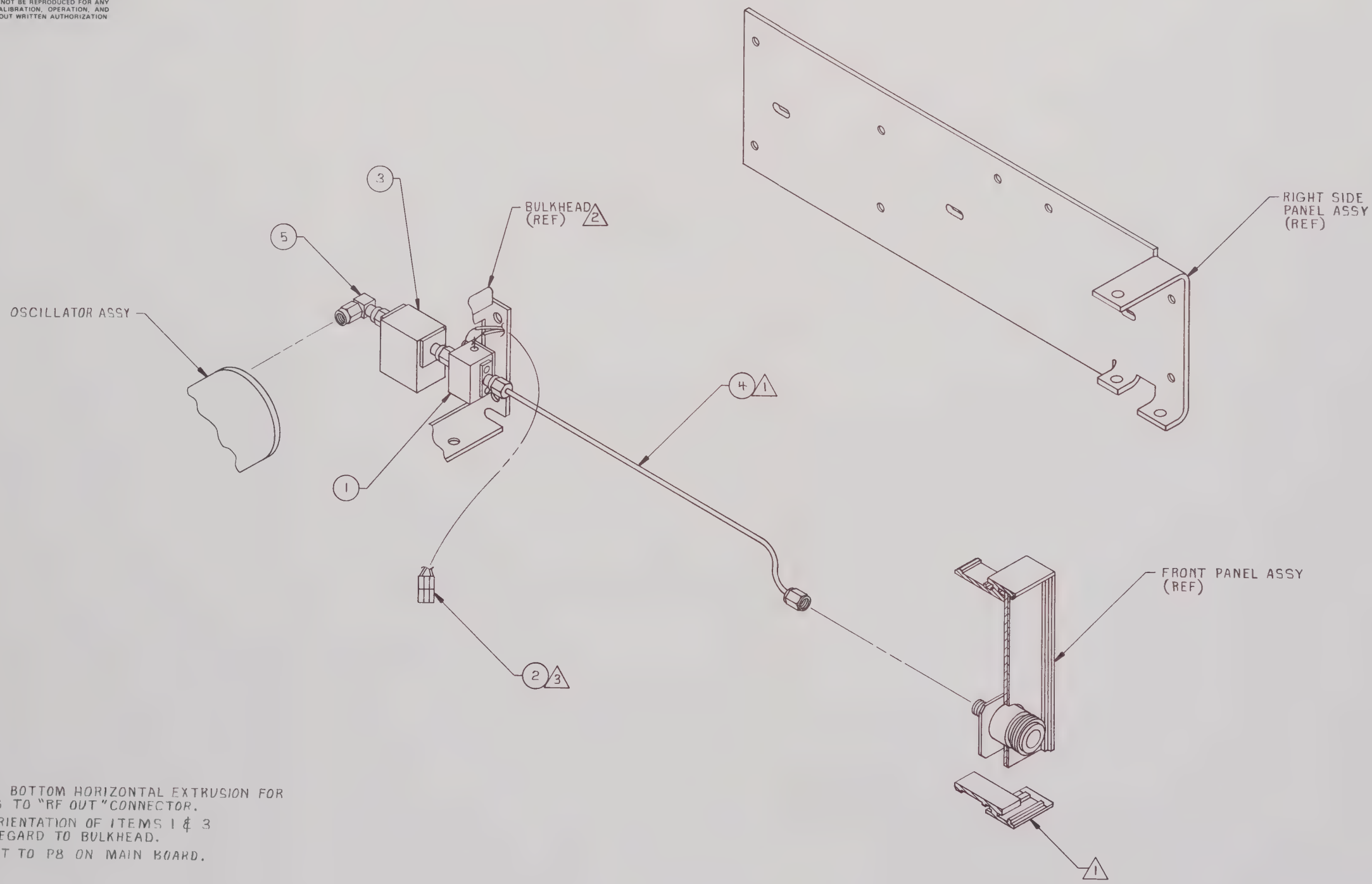
REV	ECN	BY	DATE	APP



1. REMOVE BOTTOM HORIZONTAL EXTRUSION FOR ACCESS TO "RF OUT" CONNECTOR.
2. NOTE ORIENTATION OF ITEMS 1 & 3 WITH REGARD TO BULKHEAD.
3. CONNECT TO P8 ON MAIN BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 6/14/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR JC Stagg	7/85	TITLE ASSY, RF STRING 964 STANDARD
	RELEASE APPROV 7/17/85		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ±1° XX ± .030		
	DO NOT SCALE DWG		MODEL NO 964 / DWG NO 0102 00-2226 / REV A
	SCALE 1/1		CODE IDENT 23338 / SHEET 1 OF 1

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG RF STRING 964	0102-00-2226	WVTK	0102-00-2226	1
1	ASSY DRW, ATTENUATOR	0102-00-1183	WVTK	0102-00-1183	1
1	HOUSING ATTENUATOR	954-7303	WVTK	1400-01-7303	1
1	SUBSTRATE	954-7310	WVTK	1400-01-7310	1
1	ATTEN COVER	954-7503	WVTK	1400-01-7503	1
1	SMD, CAP, CHIP (.020 X .020), 60PFd	A/3530/060	*****	1509-90-0015	1
1	SMD, CAP, CHIP (.020 X .020), 20PFd	20PF-20MIL	DEXCL	1509-90-0016	1
1	RFI FEED THRU	859616-1	AMP	1509-90-0031	1
1	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
1	GROUND LUG	646	ZIER	2100-04-0042	1
1	CONNECTOR, MALE	807001-00360	SOCPX	2100-99-0059	1
1	CONNECTOR, FEMALE	807001-00350	SOCPX	2100-99-0060	1
1	LOCK WASHER, SPLIT, SS, #0	#0 LOCK WASHER REQ S/S	CMRCL	2800-45-1000	1
1	WASHER, S/S, #2, 0.149 OD	NAS620C2	CMRCL	2800-46-2100	1

WAVETEK PARTS LIST | TITLE: ASSY, RF STRING | ASSEMBLY NO. 1101-00-2226 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	MACHINE SCREW, PAN HEAD, PHLPS, 18-8 SS,	2-56X3/16PAN PLPS M/S	CMRCL	2800-48-2103	1
1	SMD, DIODE, PIN, CHIP	5082-0012	HP	4805-02-0012	1
2	ASSY DRWG, REAR PANEL	0102-00-1179	WVTK	0102-00-1179	1
2	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
2	WIRE, HU, 22GA	H0101029 (BRN)	JUDD	6000-32-2001	1
2	WIRE, HU, 22GA	H0101029 (ORN)	JUDD	6000-32-2003	1
5	CONNECTOR 90'	2994-6001	SOL	2100-99-0012	1
3	ISOLATOR	3000-00-0096	WVTK	3000-00-0096	1
4	COAX ASSY	964-0031	WVTK	6009-90-0031	1

WAVETEK PARTS LIST | TITLE: ASSY, RF STRING | ASSEMBLY NO. 1101-00-2226 | REV

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES | MATERIAL | FINISH WAVETEK PROCESS | DRAWN | DATE | PROJ ENGR | RELEASE APPROV | TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030 | DO NOT SCALE DWG | SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST ASSY, RF STRING

MODEL NO 964 | DWG NO 1101-00-2226 | REV | CODE IDENT 23338 | SHEET | OF

BISHOP GRAPHICS ACCUPRESS REORDER NO A2708S

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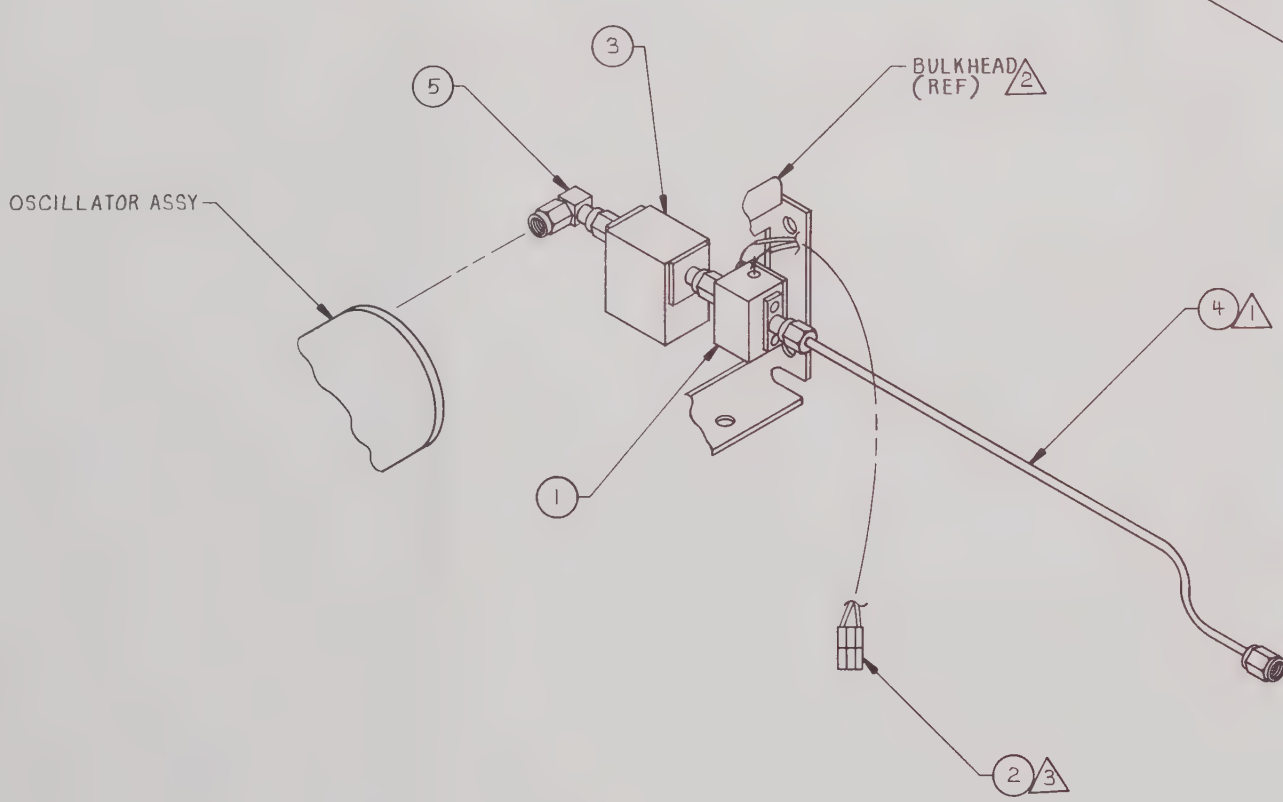
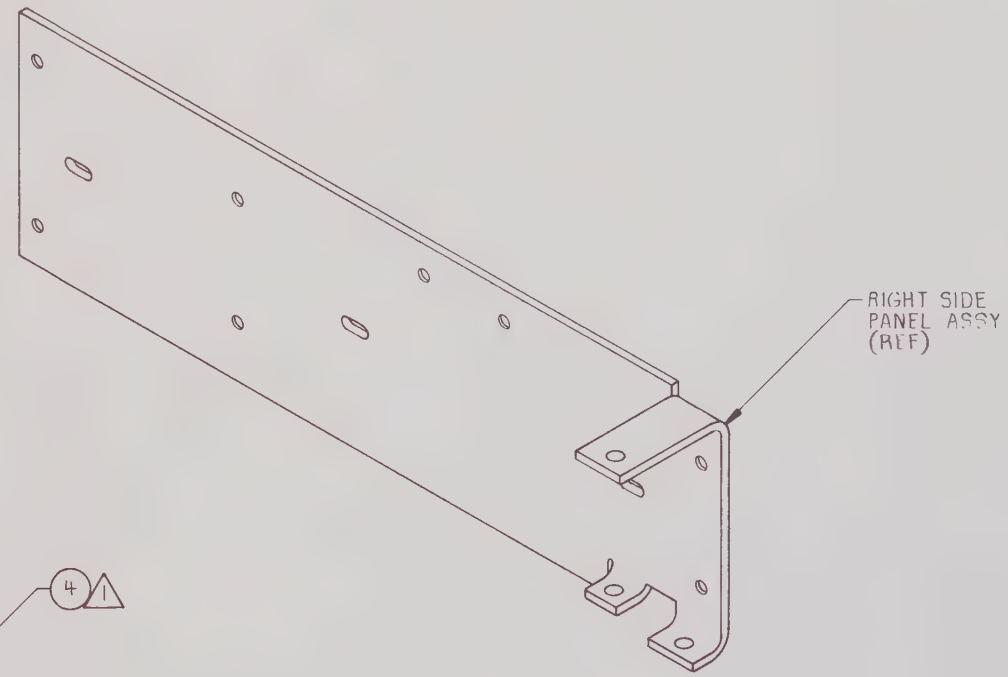
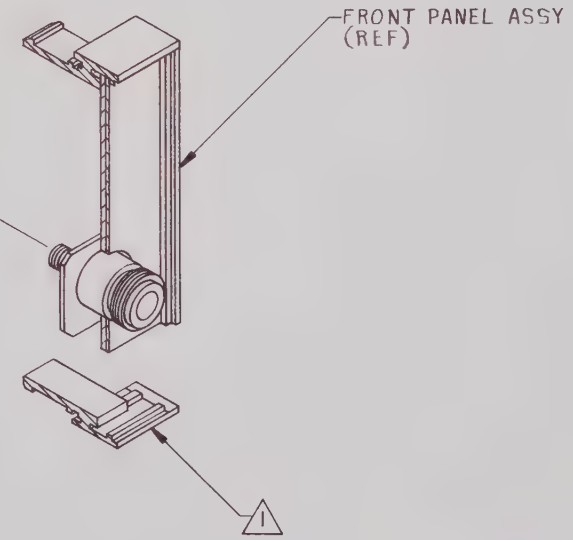
REV	ECN	BY	DATE	APP







1. REMOVE BOTTOM HORIZONTAL EXTRUSION FOR ACCESS TO "RF OUT" CONNECTOR.
2. NOTE ORIENTATION OF ITEMS 1 & 3 WITH REGARD TO BULKHEAD.
3. CONNECT TO P8 ON MAIN BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe	DATE 6/6/85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSY, RF STRING 965 STANDARD
	MFG ENGR / APPROV	7/1/85	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 965 / DWG NO 010-00-2227 / REV A
	SCALE 1/1		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS ACCUPRESS REORDER NO. A27988

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG RF STRING 965	0102-00-2227	WVTK	0102-00-2227	1
1	ASSY DRW, ATTENUATOR	0102-00-1183	WVTK	0102-00-1183	1
1	HOUSING ATTENUATOR	954-7303	WVTK	1400-01-7303	1
1	SUBSTRATE	954-7310	WVTK	1400-01-7310	1
1	ATTEN COVER	954-7503	WVTK	1400-01-7503	1
1	SMD, CAP, CHIP (.020 X .020), 60PFd	A/3530/060	*****	1509-90-0015	1
1	SMD, CAP, CHIP (.020 X .020), 20PFd	20PF-20MIL	DEXCL	1509-90-0016	1
1	RFI FEED THRU	B59616-1	AMP	1509-90-0031	1
1	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
1	GROUND LUG	646	ZIER	2100-04-0042	1
1	CONNECTOR, MALE	807001-00360	SOCPX	2100-99-0059	1
1	CONNECTOR, FEMALE	807001-00350	SOCPX	2100-99-0060	1
1	LOCK WASHER, SPLIT, SS, #0	#0 LOCK WASHER REQ S/S	CMRCL	2800-45-1000	1
1	WASHER, S/S, #2, 0.149 OD	NAS620C2	CMRCL	2800-46-2100	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, RF STRING	1101-00-2227	

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	MACHINE SCREW, PAN HEAD, PHLPS, 18-8 SS,	2-56X3/16PAN PLPS M/S	CMRCL	2800-48-2103	1
1	SMD, DIODE, PIN, CHIP	5082-0012	HP	4805-02-0012	1
2	ASSY DRWG, REAR PANEL	0102-00-1179	WVTK	0102-00-1179	1
2	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
2	WIRE, HU, 22GA	H0101029 (BRN)	JUDD	6000-32-2001	1
2	WIRE, HU, 22GA	H0101029 (ORN)	JUDD	6000-32-2003	1
5	CONNECTOR 90°	2994-6001	SOL	2100-99-0012	1
3	ISOLATOR, 7-12.4 GHZ	AER 1475	AERCM	3000-00-0053	1
4	COAX ASSY	965-0032	WVTK	6009-90-0032	1

WAVETEK PARTS LIST	TITLE	ASSEMBLY NO.	REV
	ASSY, RF STRING	1101-00-2227	

PAGE 2

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, RF STRING
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 965 / DWG NO 1101-00-2227 / REV
	SCALE		CODE IDENT 23338 / SHEET / OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A2786

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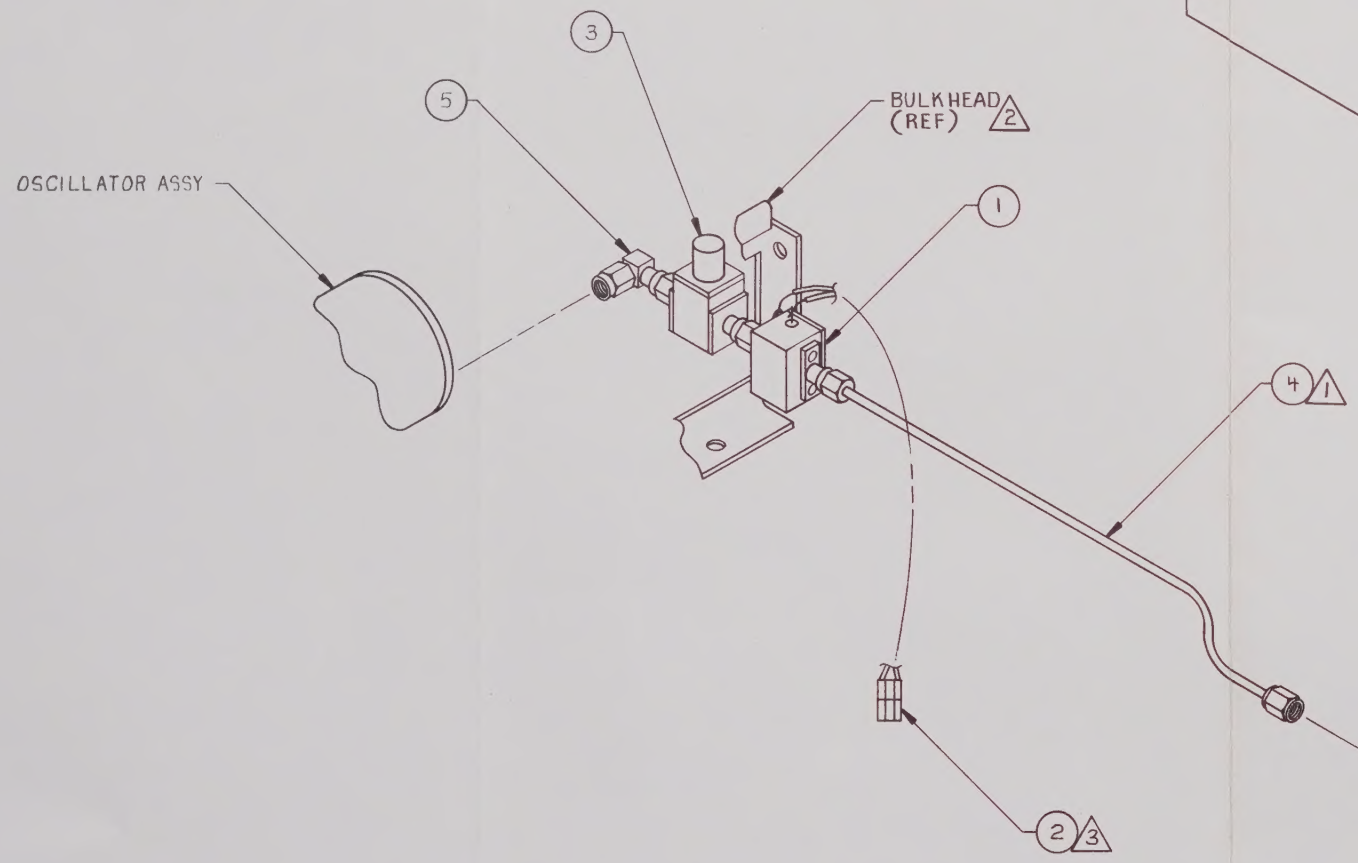
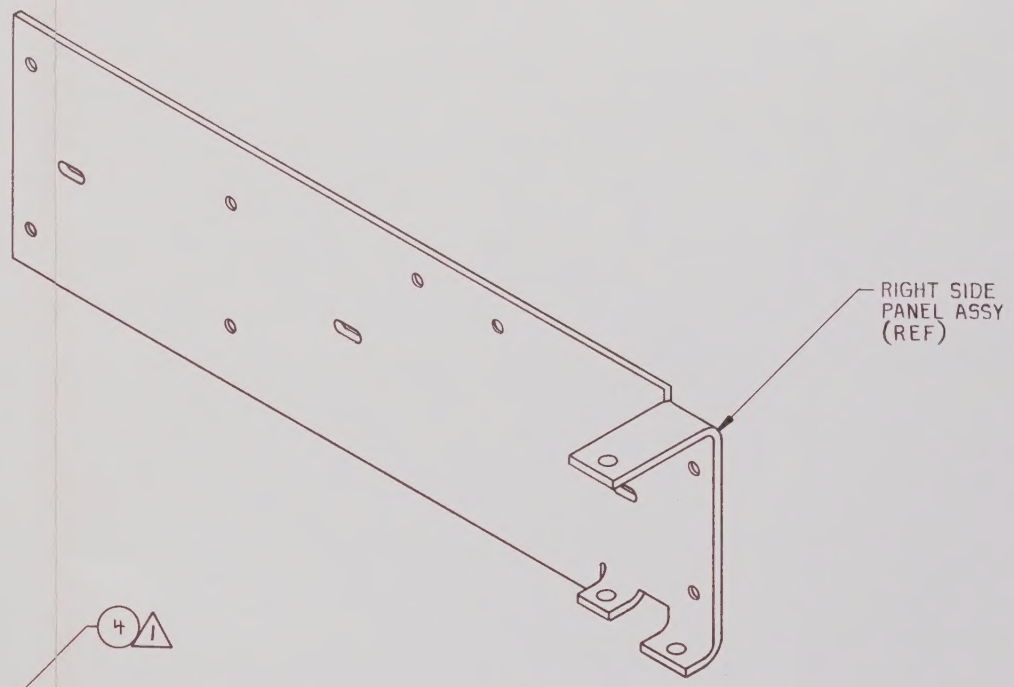
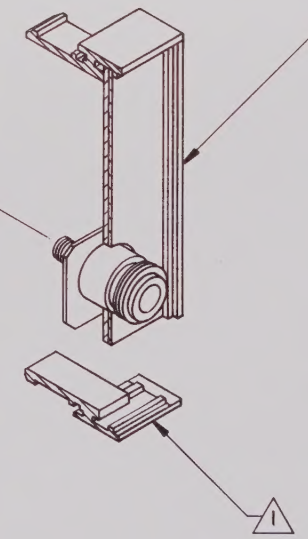
REV	ECN	BY	DATE	APP
A	RELEASED	AC	7/17/85	AS







1. REMOVE BOTTOM HORIZONTAL EXTRUSION FOR ACCESS TO "RF OUT" CONNECTOR.
2. NOTE ORIENTATION OF ITEMS 1 & 3 WITH REGARD TO BULKHEAD.
3. CONNECT TO P8 ON MAIN BOARD.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Joe 6/18/85	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJ ENGR 7/1/85	TITLE ASSY, RF STRING 967 STANDARD	
FINISH WAVETEK PROCESS	RELEASE APPROV 7/17/85		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030	MODEL NO. 967	DWG NO. 0102-00-2228 REV A
	DO NOT SCALE DWG	CODE IDENT 23338	SHEET OF
	SCALE 1/1		

BISHOP GRAPHICS-ACCUPRESS REORDER NO. 427686

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG RF STRING 967	0102-00-2228	WVTK	0102-00-2228	1
1	ASSY DRW, ATTENUATOR	0102-00-1183	WVTK	0102-00-1183	1
1	HOUSING ATTENUATOR	954-7303	WVTK	1400-01-7303	1
1	SUBSTRATE	954-7310	WVTK	1400-01-7310	1
1	ATTEN COVER	954-7503	WVTK	1400-01-7503	1
1	SMD, CAP, CHIP (.020 X .020), 60PFd	A/3530/060	*****	1509-90-0015	1
1	SMD, CAP, CHIP (.020 X .020), 20PFd	20PF-20MIL	DEXCL	1509-90-0016	1
1	RFI FEED THRU	859616-1	AMP	1509-90-0031	1
1	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
1	GROUND LUG	646	ZIER	2100-04-0042	1
1	CONNECTOR, MALE	807001-00360	SOCPX	2100-99-0059	1
1	CONNECTOR, FEMALE	807001-00350	SOCPX	2100-99-0060	1
1	LOCK WASHER, SPLIT, SS, #0	#0 LOCK WASHER REQ S/S	CMRCL	2800-45-1000	1
1	WASHER, S/S, #2, 0.149 OD	NAS620C2	CMRCL	2800-46-2100	1

WAVETEK PARTS LIST	TITLE: ASSY, RF STRING	ASSEMBLY NO. 1101-00-2228	REV

PAGE 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
1	MACHINE SCREW, PAN HEAD, PHLPS, 18-8 SS,	2-56X3/16PAN PLPS M/S	CMRCL	2800-48-2103	1
1	SMD, DIODE, PIN, CHIP	5082-0012	HP	4805-02-0012	1
2	ASSY DRWG, REAR PANEL	0102-00-1179	WVTK	0102-00-1179	1
2	HEADER, CONN 3 PIN	640440-3	AMP	2100-02-0117	1
2	WIRE, HU, 22GA	H0101029 (BRN)	JUDD	6000-32-2001	1
2	WIRE, HU, 22GA	H0101029 (ORN)	JUDD	6000-32-2003	1
5	CONNECTOR 90'	2994-6001	SOL	2100-99-0012	1
3	ISOLATOR	3000-00-0129	WVTK	3000-00-0129	1
4	COAX ASSY	967-0033	WVTK	6009-90-0033	1

WAVETEK PARTS LIST	TITLE: ASSY, RF STRING	ASSEMBLY NO. 1101-00-2228	REV

PAGE 2

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, RF STRING
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 967 / DWG NO 1101-00-2228 / REV
	SCALE		CODE IDENT 23338 / SHEET / OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A27088

MP MASTER
MA35700